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ABSTRACT

As part of a multiphased study of trends and priorities in vocational education in Missouri, four project consultants were hired to write reports on labor market needs in Missouri, vocational education delivery systems in the state, and fiscal resources available for Missouri vocational education programs. These individual reports were synthesized into one document that comprised analyses of each of the three areas under examination, recommendations to Missouri policymakers concerning each area, 30 tables of pertinent data, and 11 appendixes dealing with such topics as the division of career and adult education in the state, locations of designated area vocational schools, vocational program subject area scope statements, vocational education program offerings, enrollment data, local advisory council participation, program termination guidelines, vocational student organizations, labor supply and demand data, and the growth of vocational education in the state. Included among the major recommendations set forth in the study were the following: curricula, finances, and resources should be assessed in light of labor market needs; underserved rural areas should receive priority consideration for funding and program expansion; and financial resources should be committed to a plan whereby teachers can receive the training in the use of computers and electronic devices that they need to stay ahead of the next generation of students. (MN)

THE YEAR OF THE PUBLIC SCHOOLS, 1983-84

ED247385

Vocational Education Trends and Priorities

A Study of Vocational Education in Missouri

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REACHING FOR EXCELLENCE IN MISSOURI SCHOOLS

VOCATIONAL EDUCATION TRENDS AND PRIORITIES:
A STUDY OF VOCATIONAL EDUCATION IN MISSOURI

A Collection of Reports and Other Documents
Provided by Consultants and Staff of State
Agencies Under the Direction of the UMC Research Team

Presented to

Department of Elementary and Secondary Education
Division of Career and Adult Education

Dr. Arthur Mallory, Commissioner
Dr. Frank Drake, Assistant Commissioner

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PREFACE

Business people, legislators, and other state and community leaders are frequently perplexed by the organization and delivery of vocational education. Yet, these individuals are often asked to support the system with their votes, their money, their hiring practices and their time. These same individuals are infrequently involved in the comprehensive review and analysis of critical issues facing vocational/technical education. The primary purpose of Vocational Education Trends and Priorities: A Study of Vocational Education in Missouri was to address the following three major goals with input from representatives of groups of Missouri citizens who have a stake in the future of vocational education.

Goal I. To identify, assemble, analyze and evaluate the current and projected labor market needs for the State of Missouri that can be met appropriately by the State's vocational and technical education delivery system with available and anticipated resources.

Goal II. To describe the scope and nature of the current system of vocational and technical education in Missouri and recommend any modifications necessary to cause the delivery system to be increasingly responsive to current and projected labor market needs.

Goal III. To describe the current funding pattern for Missouri's vocational and technical education program and recommend modifications necessary to implement a delivery system required to meet current and projected labor market needs through year 2000.

This document represents the collective efforts of consultants, staff members of the Division of Career and Adult Education of the Missouri Department of Elementary and Secondary Education as well as the University of Missouri-Columbia (UMC) research team to provide background information to a project advisory committee, The 1984 Vocational Education Study Committee, appointed by the Commissioner of Education, Dr. Arthur Mallory. For the readers' convenience, information related to each of the previously identified goals is addressed in a separate section of the report.

This study is a direct result of a successful collaboration among Missouri business, legislative, governmental, and educational leaders. The study was funded by the Missouri General Assembly and guided by the Missouri Department of Elementary and Secondary Education, Division of Career and Adult Education, with technical and research assistance provided by the College of Education, University of Missouri-Columbia and four commissioned consultants (See Appendix I).

The Missouri Commissioner of Education, Dr. Arthur Mallory, appointed a group of business, community, governmental and educational leaders to a project advisory committee titled The 1984 Vocational Study Committee. Commissioner Mallory then charged this group with conducting a study that would focus on three significant topics concerning vocational education in Missouri; labor market needs, delivery systems and fiscal resources for vocational education in Missouri. This report partially represents the work of four Project Consultants:

Labor Market Needs:	Dr. Patricia M. Flynn Associate Professor of Economics Bentley College, and Visiting Scholar Federal Reserve Bank of Boston
Delivery Systems:	Dr. Ray D. Ryan Vocational Education Consultant Scottsdale, Arizona
Fiscal Resources:	Dr. Ernst Stromsdorfer Professor, Department of Economics Washington State University
	Dr. William McLure Professor Emeritus University of Illinois-Champaign

GOAL I: LABOR MARKET NEEDS

SECTION I - EMPLOYMENT IN MISSOURI: PAST AND PRESENT

The population in Missouri, which was 4,916,686 in 1980, has been expanding well below the national average for the past two decades. In the 1960's, Missouri's population grew by 0.8% a year compared to 1.3% nationally. Population growth slowed to 0.5% a year in the state in the 1970's, while the U.S. population continued to expand at just over one percent (1.2%) annually. (See Table 1)*

Minorities account for approximately ten percent of Missouri's population -- a share that has been relatively stable in recent years. Almost all of these minorities are Blacks, a group that in 1980 represented a smaller percentage of the state's residents than the national average of 11.7%. Persons of Spanish origin accounted for only 1.1% of the state's population in 1980 -- substantially less than the 6.4% nationwide.

Missouri's population is slightly older than that of the U.S. overall. In 1980 the median age in the state was 30.8 years, whereas the average nationally was 30.0 years. In Missouri 13.2% of the population was over 64 years of age compared to 11.3% of the U.S. population.

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*Tables are located at the end of the text.

Consistent with nationwide trends, the educational level of Missouri's population is rising. The median educational level in the state was 12.4 years in 1980, just under the U.S. average of 12.5 years. In 1980, sixty-four percent of Missouri's population had a high school diploma and 13.9% had completed four or more years of college; comparable figures for the U.S. overall are 68.6% and 17.0%.

Labor Force Participation

The labor force participation rate (LFPR) in Missouri, that is, the percent of the population sixteen years of age and older that is working or looking for work, was approximately 60% in 1980. Eighty percent of the population in the "prime age" category, between 25 and 44 years of age, were working or looking for work. For individuals over 50 years old, the LFPR drops precipitously: from 71.5% for those aged 50 to 54, to 63.1% for those between 55 and 59 years old, to 46.2% for individuals 60 to 64, to 12.6% for those over 65 years of age.

Labor force participation in Missouri is below the national average for both males and females. In 1980, for instance, while the labor force participation rate (LFPR) in Missouri was 74.3% for males and 49.3% for females, comparable rates nationwide were 77.4% for males and 51.5% for females. The differential between the state and national rates for males has narrowed in recent years as the drop in the participation rate of males in the state was not as great as the decline nationally. In contrast to male participation in the work force, at both the state and national level, the LFPR of females rose over eight percentage points during the 1970's. By 1980, females accounted for 43.7% of Missouri's labor force, compared to less than one-third in 1960.

Unemployment

Unemployment rates in both the state and the nation rose during the recession in the mid-1970's, fell from 1976 to 1979, then increased again during the recession of the early 1980's. Throughout the 1970's Missouri's unemployment rate was below the national average. Relatively slow employment growth and the relatively small drop in the LFPR of males, however, have resulted in the state's unemployment rate exceeding that of the U.S. in the early 1980's.

Trade Unionism

Today as in the past, a relatively high proportion of Missouri's workers are members of labor unions. The gap between the state and the nation, however, has closed considerably in the past two decades, with membership at both levels on the decline. In 1980, for instance, 27.6% of the state's nonagricultural employees were union members, compared to 24.7% nationwide.[1] In 1964, 37.9% of the state's workers were union members, whereas 29.5% of workers nationwide were.

Employment

Employment in Missouri has grown below the national average in the past two decades. In the 1960's employment in the state grew by 1.4% a year, compared to 2.0% a year nationally. (See Table 1.) Although interrupted mid-decade by a recession, the average rate of growth in employment accelerated in the 1970's to 1.9% a year in Missouri and 2.6% in the U.S.

Employment by Industry. During the 1960's, the employment base in Missouri shifted away from manufacturing toward service-producing sectors. While employment overall grew on average at a rate of 1.4% a year during the decade, the services sector expanded by 3.6% a year, public administration grew by 3.2% a year, finance, insurance and real estate, by 2.1% a year, and retail trade and wholesale trade by 2.1% a year. Mining also experienced relatively fast growth, although this sector accounted for less than one percent of the state's total employment. The agricultural sector experienced the largest decline in both absolute and relative terms: employment dropped over 64,000 jobs which represented a 4.3% average annual decline throughout the decade.

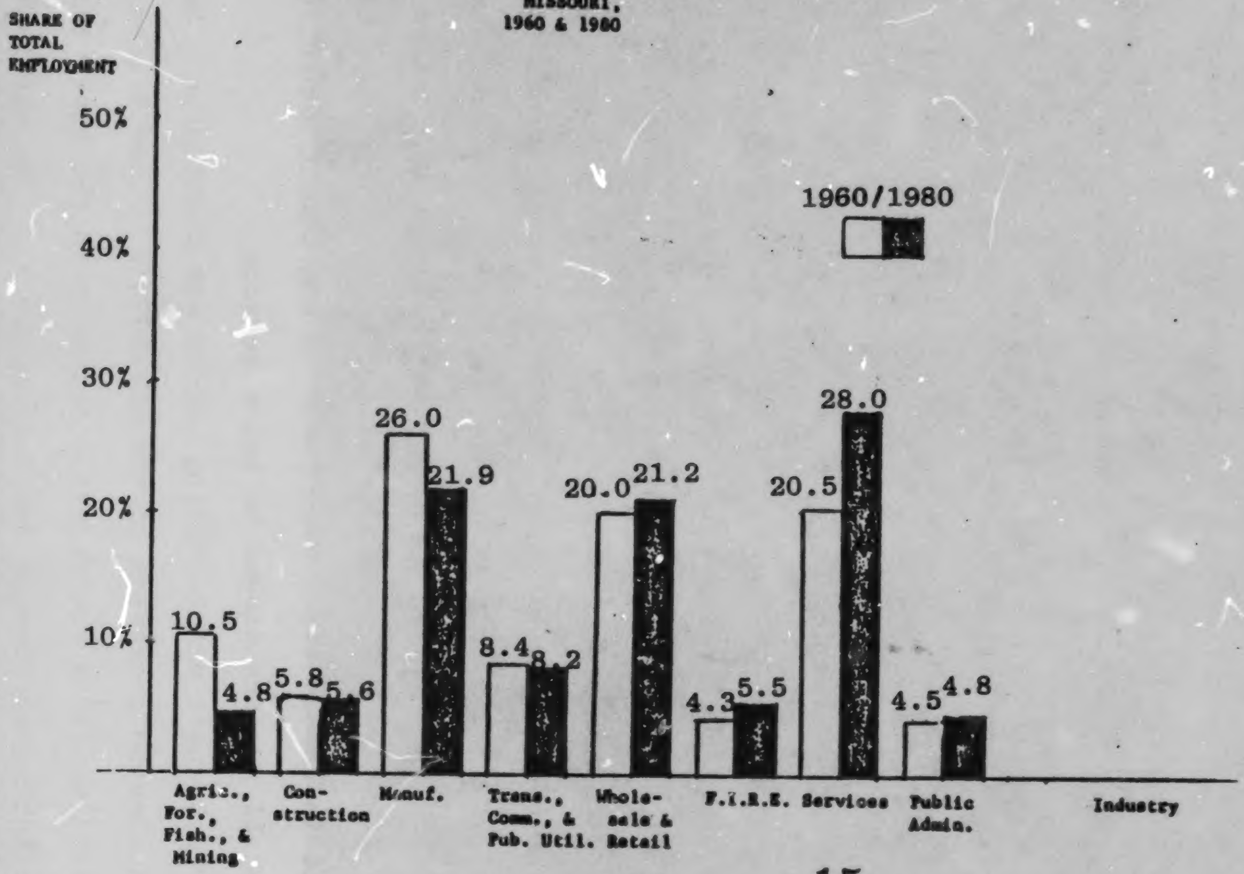
Manufacturing employment grew well below average in the 1960's (+0.5% a year). Within the manufacturing sector, however, there was significant diversity. Nondurable goods manufacturing employment actually declined, due primarily to a large drop (-2.0% a year) in employment in the food and kindred industry. Employment in the nondurable textile and apparel industries also declined. In contrast, employment in the durable goods manufacturing sector grew slightly above average. The electrical and electronic equipment and transportation equipment industries, in particular, led this employment growth as each expanded by one-third over the decade, and grew more than twice as fast as the state's employment overall.

As employment growth accelerated in the 1970's, the trend away from manufacturing continued. (See Chart 1.) The services and finance, insurance and real estate sectors continued to grow relatively fast, while agricultural employment kept declining. Health services and education are the largest components of the services sector. Employment in health services grew by over 7% a year during the 1970's, compared to the overall average growth rate of +1.9%; the educational sector grew by +2.9% a year. Business services were the fastest growing component of the services sector, (+11.9% a year); however, this industry accounted for less than 3% of total employment by 1970. In contrast to the earlier decade, the transportation, communications and public utilities sectors grew considerably above average in the 1970's. Employment in the public administration and the retail sectors slowed to below average.

The state's manufacturing sector was particularly hard hit during the nationwide recession of the mid-1970's. (See Graphs 1 and 2.) From 1974 to 1975, when total employment in the state fell by 2.7%, manufacturing employment declined by 10.3%. The manufacturing industries most critically affected were: transportation equipment which

CHART 1

EMPLOYMENT BY INDUSTRY
MISSOURI,
1960 & 1980



Source: U.S. Department of Commerce, Bureau of the Census, General Social and Economic Characteristics: Missouri. 1960. 1980.

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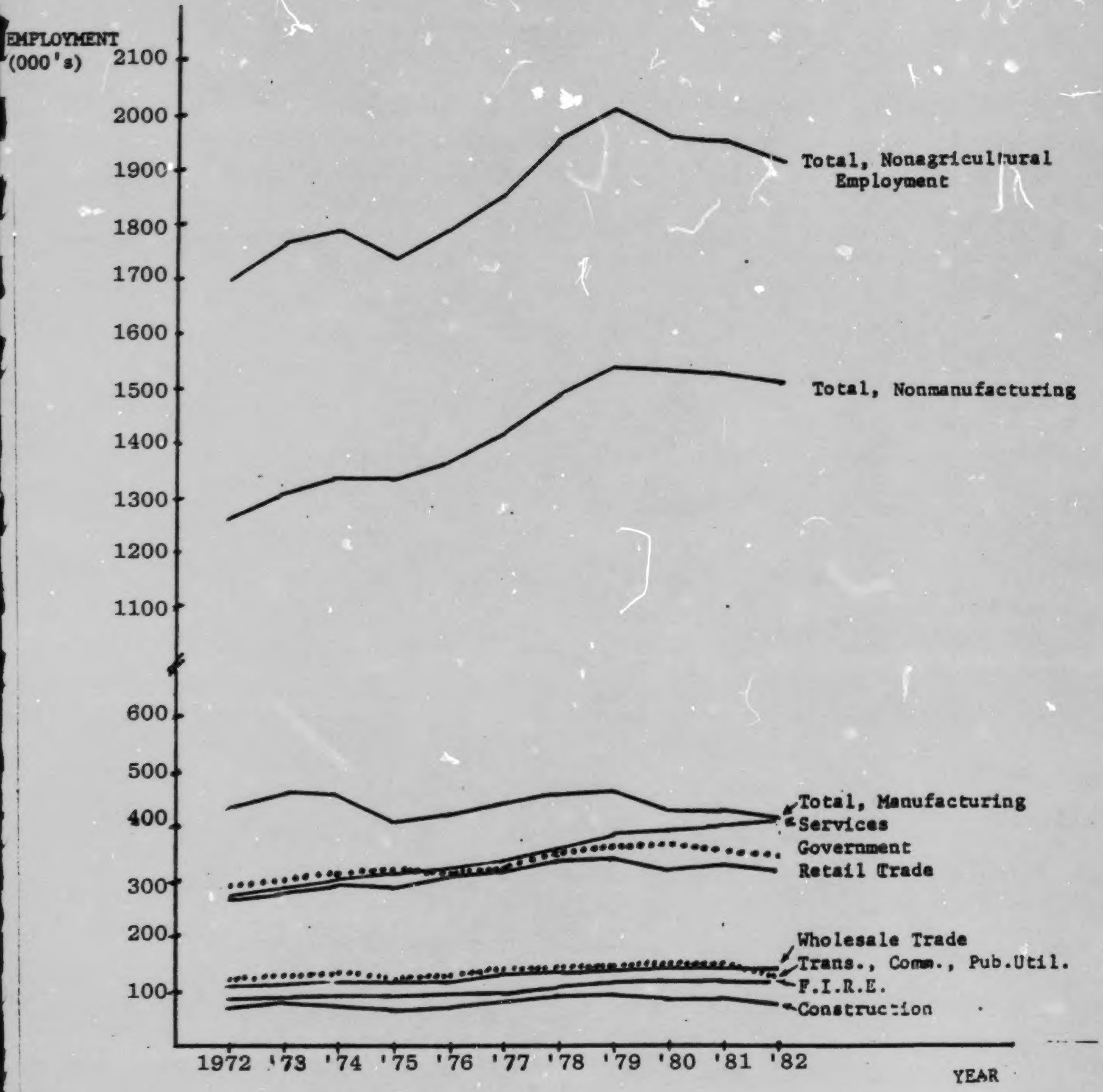
GRAPH 1

EMPLOYMENT BY INDUSTRY

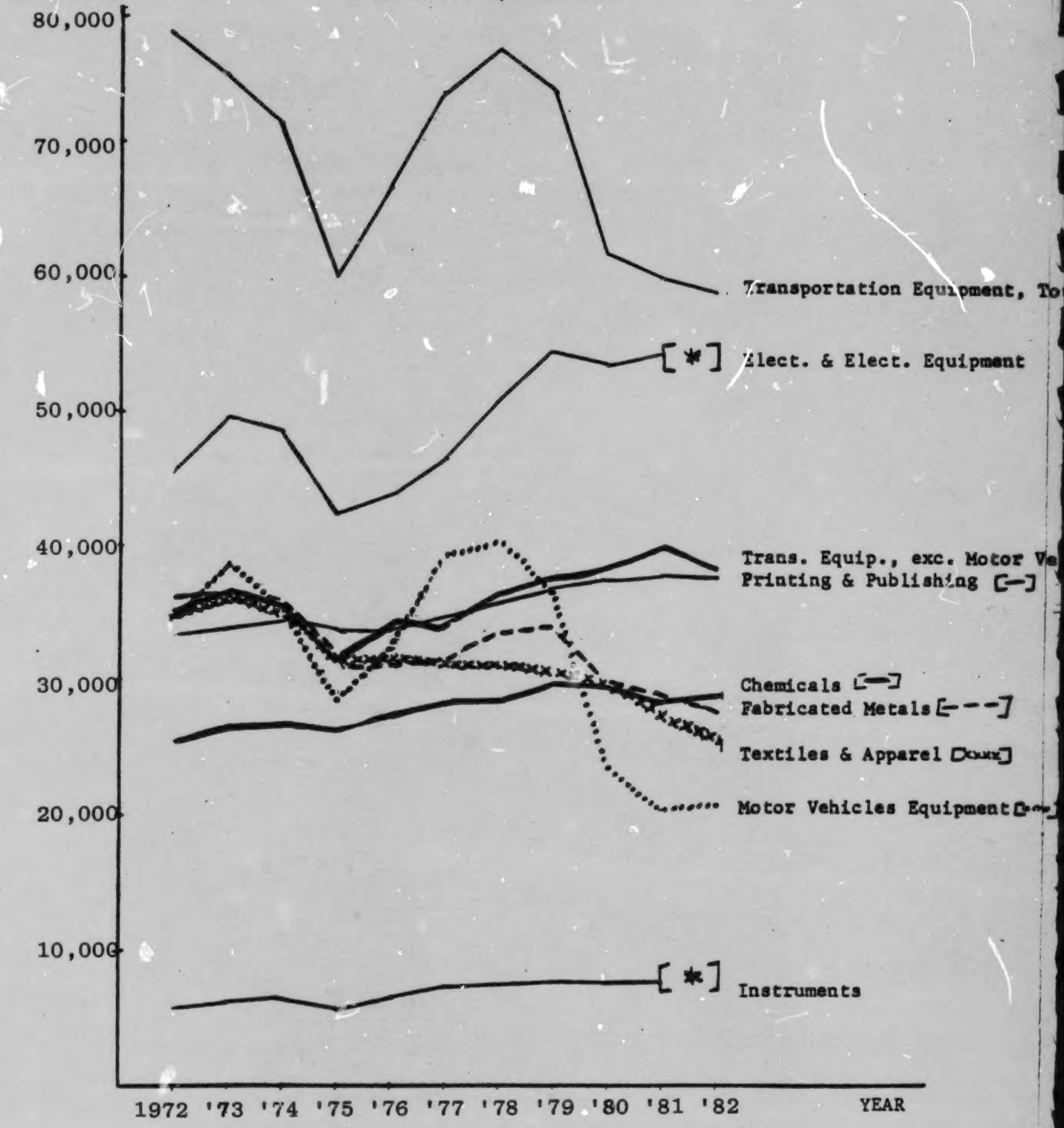
IN MISSOURI, 1972-1982



Source: Missouri Division of Employment Security

GRAPH 2

EMPLOYMENT BY MANUFACTURING INDUSTRY IN MISSOURI, 1972-1982



[*] = 1982 data not comparable due to definition change.

Source: Missouri Division of Employment Security fell by 15.6% from 1974 to 1975, fabricated metals which declined by 13.6%, electrical equipment, down 13.0% and textiles and apparel, down 11.4%. From 1974 to 1975 these five industries accounted for a loss of over 25,000 jobs -- over half of all jobs lost. Nonmanufacturing employment remained relatively stable during that time, and employment in the services sector actually expanded.

When the state's economy rebounded, growing at a rate of +4.1% a year from 1976 to 1979, manufacturing employment also turned around and registered growth of approximately 3% a year. (See Table 2.) Employment in the transportation equipment industry, fabricated metals and the electrical equipment industries expanded to more than compensate for the jobs lost in their industries during the recession. Textiles and apparel, however, persisted to decline.

Employment in the state fell again during the recession of the early 1980's; however, by 1982 total employment was still 10% above the recessionary low point reached in 1975. Employment in nonmanufacturing overall also declined (-0.8% a year); however, employment in the services sector continued to rise. The transportation equipment, fabricated metals and textiles and apparel industries were again especially hard hit by the recession, falling by 6.8%, 6.2% and 5.8% a year, respectively from 1979 to 1982. Other durable goods industries that declined by more than 5% a year on average in the early 1980's include: stone, clay and glass, lumber and wood, primary metals, and nonelectrical machinery. While more recession resistant than in the mid-1970's, employment in the electrical and electronic equipment industry also declined.*

The loss of jobs in the transportation equipment industry was attributable to the rapid decline of the motor vehicles equipment industry, in which employment fell by 14.5% a year on average from 1979 to 1982. As Graph 2 indicates, the motor vehicles equipment industry is the major cause of the cyclical volatility in the state's employment. Employment in the other transportation equipment industries, the bulk of which is in the aircraft and space vehicles industry, actually rose during this period.

The printing and publishing manufacturing industry also experienced growth (+0.4% a year) from 1979 to 1982. Employment in the chemicals industry declined, but did so relatively slowly compared to employment overall.

In terms of numbers of jobs, total employment in Missouri expanded by 216,100 from 1972 to 1982. (See Table 2.) In that decade the number of jobs increased by 129,100 in the services sector, by 49,700 in retail trade, by 26,900 in government, by 22,200 in wholesale trade and by 15,800 in finance, insurance and real estate. In contrast, there were over 34,000 fewer jobs in manufacturing in 1982 than a decade earlier. Employment in the motor vehicle equipment industry alone fell by 14,200, while the textile and apparel industries declined by 9,500, fabricated metals fell by 7,700 and the leather industry lost 6,400 jobs.

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*At least from 1979 to 1981. A definition change in 1982 renders the employment data for this industry non-comparable with earlier years' data.

By 1982 Missouri's industrial employment mix was strikingly similar to that of the U.S. economy overall. (See Table 3.) In the state and in the nation, 22% of all wage and salary employment was in the services sector, 20% was in manufacturing and 16% was in retail trade. Missouri has a slightly larger proportion of its employment in the transportation, communication and public utilities and wholesale trade sectors than the U.S. in general. A relatively small share of the state's employment was in the construction, mining, agriculture and finance, insurance and real estate sectors. Within manufacturing the state has a disproportionately large share of employment in the transportation equipment, electrical and electronic equipment, chemicals, printing and publishing, and food industries.

Earnings and Wages. Employment growth has occurred both in sectors with relatively low earnings. Growth in nonmanufacturing was primarily in sectors where earnings are below average. In the services sector, for instance, average annual earnings of full-time workers in 1979 were 14.9% below the average for all industries in the state. In retail trade earnings were 16.2% below average, while in finance, insurance and real estate, earnings were 3.8% below average. (See Table 4.)

In contrast, growth in the manufacturing sector occurred in industries with considerably higher earnings. Annual earnings of full-time employees in the aircraft and space vehicles industry, for example, were over 40% above the average for all industries in 1979. In the chemicals industry, average annual earnings were 22.9% above average, and in the printing and publishing industry they were 4.4% above average. In the electrical and electronic equipment and instruments industries, earnings were slightly below the average for all industries -- however, they were significantly higher than those in the services and retail trade sectors.

Hourly wages for production workers overall in Missouri are comparable with the national average. (See Table 5.) In the rapidly growing instruments industry, however, average hourly production wages in the state were 16.2% below the U.S. average in 1979. Production wages in Missouri were also relatively low (3.7% below the national average) in the chemicals industry. In the state's electrical and electronic equipment industry, production wages were slightly higher than the national average for that industry, while in the transportation equipment industry they are considerably above the U.S. average.

Employment by Occupation. The industrial trends in employment described above resulted in changes in the occupational composition of employment in the state. From 1970 to 1980, technical workers, for instance, grew considerably above average -- at a rate of +6.4% a year compared to +1.9% for all occupations. (See Table 6.) Executive, administrative and managerial employment also grew relatively fast (+5.6% a year) as did professional (+3.0% a year) and service occupations (+2.7% a year). In contrast, employment in occupations in the precision production craft and repair, and operative, fabricator and laborer categories grew well below average. Employment in the farming, fisheries and forestry occupations declined.

By 1980, jobs in the managerial and professional specialities accounted for approximately 20% of the state's employment.* While growth in the technical field was particularly strong in the 1970's, technical jobs accounted for less than three percent of all employment. Administrative support occupations (which include clerical) continued to represent about 17% of total employment over the decade. Sales occupations remained 10% of the state's employment. While precision production, craft and repair, and operative, fabricator and laborer occupations were becoming a small proportion of employment, in 1980 these jobs still represented 12.2% and 19.1%, respectively of all employment in the state.

The types of jobs present in the fast-growing nonmanufacturing sectors differ considerably from those being lost in the manufacturing sector. To illustrate this diversity, Table 7 presents the occupational distribution of the four sectors in which job growth was the largest in the state from 1972 to 1982, and of the four manufacturing industries in which the state lost the greatest number of jobs.

In the services sector, 40.2% of all workers were in professional occupations in 1980. Administrative support occupations accounted for almost half of the jobs in the finance, insurance, and real estate sectors, as well as in the wholesale trade sector. In addition, sales occupations represented over one-third of all jobs in the retail trade sector.

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*Comparable Census data for the nation have not yet been released.

In contrast, in the more traditional manufacturing industries, between two-thirds and 80% of the workforce were in jobs in the precision production, craft and repair, or operatives, fabricators, and laborers occupational categories. The vast majority of these jobs were in the latter grouping, which contains the lesser-skilled occupations. In the fabricated metals and motor vehicles equipment industries, however, skilled production, craft and repair workers comprised 23.1% and 16.8%, respectively of employment -- a far greater share than in the fast-growing nonmanufacturing sectors. In the services and finance, insurance and real estate sectors, for instance, less than 2% of the jobs were in skilled production, craft and repair occupations.

The Role of Female Workers in the Labor Market

As females became an increasingly larger share of the workforce, many entered Missouri's fast-growing services and retail trade sectors. By 1980 these two sectors accounted for 60% of all female workers in the state. (See Table 8.) In contrast, less than one-third of all male workers were employed in these two sectors. Within the services sector, two-thirds of the female workers were employed in the health and education fields. Seventeen percent of female workers in the state were employed in manufacturing -- with textiles and apparel, and electrical and electronic equipment the major sources of jobs.

By 1980, females accounted for the majority of all workers in the services, finance, insurance and real estate, and retail trade sectors. They also represented more than half of the textile and apparel workforce. As noted above, average earnings in these sectors are considerably below average: average annual earnings of full-time workers in 1979 were 16.2% below average in retail trade, 14.9% below average in the services sector, and 37.5% below average in the textile and apparel industries.

Relative to their share of total employment, females held a disproportionately large share of jobs in the electrical and electronic equipment industry as well. While earnings in the electrical and electronic equipment industry were also below average in 1979, females working full-time in this industry earned on average 46.4% more than the females working full-time in the textile and apparel industries.

In terms of occupations, administrative support positions accounted for approximately 30% of all female workers in 1980. (See Table 9.) Service occupations were the second largest occupational group, with short order cooks, waitresses, nursing aides, maids and child care workers the major detailed occupations. Professional specialties were the third largest source of jobs for females.

Teachers (except post-secondary) and registered nurses accounted for approximately 90% of the professional jobs held by females.

By 1980, females were the majority of all workers in service, administrative support and professional occupations in Missouri. In contrast, females held a relatively small percentage of the farming, precision production, craft and repair, and operative, fabricator and laborer jobs -- occupational groups that were growing relatively slowly or declining in the state.

SECTION II - VOCATIONAL AND TECHNICAL EDUCATION AND PROJECTED LABOR MARKET NEEDS

Vocational and technical education programs are distinguished from other types of education programs by their specific goal to provide graduates with marketable job skills. Individual vocational and technical education programs are usually judged by their rates of job placement in the field of training at the time of graduation. Given time lags for training and initially implementing the program, educational institutions must seek to anticipate future employment needs.

To determine more specifically the role of vocational and technical education in preparing workers for employment in the state, educators need to answer the following questions:

- How many job openings will there be in various occupations?
- What are the skill requirements of these jobs?
- Which jobs are entry-level positions for trained vocational and technical graduates?
- Are these entry-level jobs likely to afford workers opportunities for career development or are they dead-end jobs?
- What chance will vocational and technical education graduates have for placement when they compete with other eligible workers in the labor force?
- How many students now "in the pipeline" are receiving training for these occupations?

To answer these questions requires analysis of occupational projections, assessments of employer hiring and staffing practices and an understanding of the roles of other suppliers of skilled workers in various occupations.

This section of the paper addresses the role of vocational and technical education in meeting projected labor market needs. Initially, projected job openings in Missouri are identified. Discussion follows on how these projections relate to educational planning and vocational and technical curricula. Particular emphasis is placed on those occupations that are projected to grow relatively fast in Missouri.

Employment Projections

Projections by Industry. Employment projections suggest that the shift away from agriculture and manufacturing and into service-producing areas will continue. (See Table 10.) Three nonmanufacturing sectors -- services; finance, insurance and real estate; and transportation, communications and public utilities -- are expected to account for two-thirds of all new jobs in the state through 1985.

Past trends in manufacturing are also expected to continue. While manufacturing is expected to account for approximately 12% of all job losses through 1985, it should also account for 14% of all new jobs generated in the state. The instruments industry is expected to grow at almost three times average rate of growth for the state. Other industries anticipated to experience relatively fast growth include: transportation equipment other than motor vehicle equipment, electrical and electronic equipment, primary metals, furniture, lumber and wood, and printing and publishing. The motor vehicles equipment and textiles and apparel industries are projected to decline further.

Agricultural employment which is expected to decline by 3.5% a year, accounts for over 70% of the anticipated job losses through 1985.

Projections by Occupation. Broad occupational projections suggest that clerical, managerial and services occupations will expand relatively fast through 1985.* (See Table 11.) Average growth is projected for sales and craft occupations while slightly below average growth is anticipated for professional, technical and operative occupations. Laborer jobs are expected to grow slowly while farming occupations are projected to decline.

Clerical jobs are projected to be the largest share of all new jobs -- accounting for almost one-quarter of the openings through 1985. Professional and technical occupations represent the second largest source (14.7%) of new job openings, followed by managers, officials and proprietors (13.6%), operatives (12.6%), craft workers (11.1%), service occupations (9.7%) and sales (8.6%). Laborer occupations and farm occupations are each expected to account for less than 3% of projected job openings.

Job openings due to growth are expected to account for only one-quarter of all openings through 1985. The bulk of projected job vacancies are the result of replacement demands created when workers retire, die or quit their jobs.

Table 12 lists the detailed occupations that are projected to have the largest number of job openings through 1985. Replacement and growth needs are stated, as are average annual earnings and the sex composition of the workforce in these occupations. Detailed occupations that are projected to decline or to account for a relatively small number of job openings in the state are listed in Table 13.

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*Note: These occupational categories are different from the new U.S. Census categories that were used in the preceeding section on employment trends.

Job Openings and Educational Planning

As implied from the list of questions (page 19), identification of anticipated job openings is just the "first step" in determining education and training needs. Before translating job openings data into vocational and technical education programs, alternative sources of labor supply should be considered. Might the unemployed, re-entrants to the labor market or current employees fill those vacancies? In addition, the expected duration of skill shortages, rates of pay for projected jobs, and patterns of migration should also be analyzed. By themselves, statistics on employment demand (even when compared with data on the supply of training program completions) may be misleading and suggest erroneous policy implications.

Labor shortages may, for instance, be the result of high turnover induced by low pay or otherwise poor working conditions. Alternatively, job openings may occur in occupations that are generally filled from within the firm -- creating actual job openings at entry-level jobs at other skill levels. Employers frequently promote current employees in lower-level jobs to vacancies in higher skilled positions. Career ladders within the firms, that is, internal labor markets (ILMs), work to the advantage of both employers and workers: the employer is given the chance to assess the individual at work prior to the holding of the higher skilled job.[2] Internal labor markets also provide career incentives and advancement opportunities for workers. These, in turn, enhance worker commitment to the firm and can reduce costly turnover.

Internal labor markets, however, can also "shelter" the better paying, more highly skilled jobs from the labor market external to the firm. A misreading by educators of job entry requirements and entry ports can thus result in trained graduates who cannot find employment appropriate to their skill level -- even though employment in the occupation is expanding. In addition, it is important for educators to be able to distinguish between entry-level jobs that are attached to job ladders and advancement opportunities as opposed to entry-level, dead-end jobs.

Once it has been determined that a new training program should be established, the question remains as to who or what institution can best provide that training: Employers, schools and colleges, government training programs? Even among educational institutions variations in "mission" and in funding and equipment constraints imply different roles of these institutions in preparing workers for employment.[3]

Survival of proprietary schools, for instance, is dependent on their ability to identify new educational markets and to respond quickly to those emerging demands. Proprietary schools demonstrate a "no-frills" approach to education with few, if any, ancillary services provided to students. Community colleges also provide job skills to students, but, in contrast to private schools, they offer highly subsidized training to all interested students. Vocational schools provide students a "cluster" of job skills combined with related theoretical foundations in the classroom. In contrast, employers seek to give workers more narrow training tailored to the firm's specific production needs.

Training for Job Openings in Missouri. The list of occupations (Table 12) projected to have the largest number of job openings in Missouri illustrates the importance of evaluating "labor demand" prior to changing vocational and technical curricula to meet employment needs.

For instance, several of the occupations with relatively high job openings predicted, such as elementary school teachers, engineers, and lawyers, require at least a four-year college degree. Registered nurses have traditionally received a diploma from a three-year program offered by hospital-affiliated schools of nursing. There is a trend nationwide, however, of these diploma schools being phased out, with more and more registered nurses receiving their training via four-year college degree programs. Four-year degree programs are also assuming a larger role in the preparation of accountants, an occupation that traditionally required no more than a two-year associate degree.[4]

Some of the other occupations listed in Table 12, such as blue collar worker supervisors, office managers, and administrative managers are jobs filled through internal labor markets, that is, jobs into which present employees are often promoted. Still other occupations anticipated to have many vacancies are not appropriate targets for vocational and technical education programs due to their relatively low level of skills required. For instance, while attitude, good work habits and neatness may be considered important attributes for workers in the stockhandlers, freight material handlers, food counter workers, delivery workers, packers and wrappers occupations -- these jobs require little or no vocational or technical job skill development. Assemblers, too, generally need manual dexterity but not training from a vocational education program. Electrical and electronic assemblers, which are usually classified separately and paid more than "assemblers", do require a somewhat higher degree of skill. These production skills can usually be taught in a few months.

Of the remaining occupations listed in Table 12, many do require vocational or technical training. These occupations include, for instance, health technicians, secretaries, real estate agents, welders, auto mechanics, heavy equipment operators, nurses aides, child care workers and practical nurses. Data on training program completions in the state for 1984 suggest shortages of skilled workers in some of these occupations -- surpluses in others. (See Table 14.) Relatively large shortages are expected in the clerical occupations, custodial service occupations and for child care workers. In the carpentry, plumbing and heavy equipment mechanics fields shortages are also anticipated. The market for health technicians is mixed. Surpluses, although relatively small, are estimated for Medical Records Technicians and Radiologic Technicians; shortages, also relatively small, are expected in the Medical Lab Technician and Dental Lab Technician fields.

Nurses aides and practical nurses are expected to be in surplus, as are real estate agents and brokers. The fact that many people take real estate courses for avocational purposes should mitigate the expected surplus in that field. Auto mechanics programs, too, tend to attract many students who do not intend to work full-time in this occupation. A review of placement records of these graduates would help assess the likelihood of the relatively large surplus suggested by these data.

Several of the occupations expected to have a relatively large number of job openings, particularly those in the service and clerical occupational groups, have especially low average earnings for full-time workers. For instance, typists, cashiers, receptionists, custodial services occupations, and food service occupations all had average earnings of less than $8,000 for full-time workers in 1979.

As noted earlier, replacement demands, rather than growth, account for the bulk of all projected job openings. Replacement demands may be due to turnover that is considered "normal" for that particular occupation and hence imply an on-going need for newly trained graduates in that field. Alternatively, replacement demands may result from a large number of retirements due to a skewed age distribution of workers in an occupation. As such, these replacement needs may indicate a relatively large one-shot replacement demand. These large one-shot replacement demands are most characteristic of craft occupations -- many of which are filled by cohorts of workers who entered these jobs after World War II.

Training programs designed to provide skills for job openings due to replacement needs, should reflect the distinctions in the causes of these openings lest long-term capital investments be made for programs that may well generate surpluses of trained workers a few years down the road.

Limitations of State Employment Projections

The preceding analysis assumes that the industrial and occupational projections used are an accurate indicator of future employment and thus a reliable guide for future training programs. There are, however, inherent limitations in the underlying assumptions and techniques used in generating employment projections.[5] Since employment projections are extrapolations of past employment trends, they more accurately portray employment needs in relatively stable, traditional industries than skill mismatches in occupations experiencing sudden changes in employment or training needs in areas of new and emerging skills. They tend, therefore, to be better indicators of "replacement" needs than new job openings.

In addition, as employment projections are based on a series of assumptions about growth in the labor force, employment, inflation, and social, technological and scientific trends, etc., their accuracy depends on having these assumptions come to fruition. Lastly, as statewide projections represent aggregate data of many varied and distinct labor market areas, they may not accurately indicate future employment needs in any particular substate area.

The industrial and occupational projections used in this paper are those presented in Missouri Employment Outlook Projections to 1985 prepared by the state's Division of Employment Security in co-operation with the U.S. Bureau of Labor Statistics.[6] These projections, published in 1980, are based on historical employment data through 1976.[7] The industrial projections for 1985 were updated in 1981. Overall employment was revised upward but by a total of only 830 jobs -- less than .05% of total employment in the state in 1980. The most significant revision was made in the motor vehicle equipment industry, in which an average annual rate of growth of +1.2% was changed to a -2.8% per year. This change results in far fewer jobs, over 1,600 per year, expected in this industry.

The occupational projections referred to earlier were not revised to account for the changes in industrial projections made in 1981. As over 80% of the jobs in the motor vehicle equipment industry in 1980 were in the precision production, craft and repair and operative, fabricator and laborer categories, projected openings in these occupations are most likely to be overstated if the revised industrial projections prove true.

Diversity of Local Labor Markets. There is wide variation among employment patterns in the state's fifteen Service Delivery

Areas (SDAs), designated under the Jobs Training Partnership Act (JTPA) of 1983. Table 14 provides employment data by industry for four representative SDAs in Missouri in 1982. Substantial differences occur in nonmanufacturing as well as within the manufacturing sectors of these areas.

For instance, while the services industry accounts for 16.6% of employment in the Kansas City-North SDA, approximately thirty percent of all employment in the St. Louis SDA is in the services sector. Retail trade accounts for less than an eighth of the St. Louis SDA's employment, compared to one-quarter of all jobs in the Central Missouri SDA. The Central Missouri SDA also has a much larger share of its employment in construction than the other areas listed, while the Boothill SDA has a relatively large share of its employment in mining, agriculture, forestry and fisheries. The transportation, communications and public utilities sector comprises approximately 20% of employment in the Kansas City-North SDA but only 6% of the Central Missouri SDA.

The differences continue. Manufacturing employment accounts for close to one in three jobs in the Boothill SDA, but less than 20% of employment in the Central Missouri SDA. The Boothill SDA should be particularly hard hit by further declines in the textile, apparel and leather industries which account for almost a third of its relatively large manufacturing sector. In contrast, other SDAs, such as Kansas City-North, will be more affected by cyclical swings in employment due mainly to the importance of the transportation equipment industry in these areas.

SECTION III - MEETING THE SKILL NEEDS OF "HIGH TECHNOLOGY" EQUIPMENT

"High technology" employment generally refers to industries that operate at the "cutting edge" of new technologies. These industries are usually identified by their relatively high proportions of Research and Development (R & D) expenditures and of professional and technical workers.[8] Table 16 illustrates, using three alternative definitions, the extent of "high technology" employment in Missouri, compared to that of the U.S. in general, the other West North Central States, and Massachusetts and California.

The most narrow definition of "high technology" includes the following industries: drugs, office and computing machines, communications equipment, electronic components and accessories, engineering and scientific instruments, measuring and controlling devices, optical instruments and lenses, medical instruments and supplies and photographic equipment and supplies. In 1980 these industries accounted for 1.6% of nonfarm wage and salary employment in Missouri; the comparable figure for the U.S. was 3.0%. The second definition, that used by the Division of Employment Security in Massachusetts for a study of high technology employment in twenty-five states, adds the rest of the instruments and electrical equipment industries, plus ordinance, and miscellaneous transportation equipment to the "narrow" definition. Missouri's relatively large share of electrical equipment employment raises the state's "high technology" closer to the national average, (3.9% versus 4.6%). The third definition, used in a study by the Federal Reserve Bank of Boston, adds the aircraft industry and the rest of the chemicals industry to the list of "high technology" industries. This definition results in a slightly higher percentage of Missouri's employment in "high technology" industries than the U.S. average, (6.5% versus 6.4%). (See Table 17.)

Although Missouri exceeds the national average using the broadest definition of "high technology" industries, these industries can be expected to account for a relatively small share of jobs in the state. Even in Massachusetts and California, states noted for their relatively high proportion of "high tech" employment -- using any of these definitions -- "high technology" employment remains below 10% of all employment.

While accounting for a relatively small share of employment in the state, "high technology" industries, as noted above, tend to have a relatively large proportion of their employment in highly skilled professional and technical jobs. "High technology" industries also tend to have a relatively high percentage of production jobs in the skilled and semi-skilled occupations compared to more traditional manufacturing industries such as textiles, apparel and leather. In many cases, "high technology" industries pay considerably well relative to alternative employment opportunities in the area.

Table 18 illustrates the occupational composition of three of Missouri's growth industries associated with "high technology". In the aircraft and space vehicles industry in Missouri, for instance, thirty percent of the workers in 1980 were in professional specialties and technical occupations. Nineteen percent of all aircraft industry employees were engineers, another 6.5% were technicians. (Only 1.2% of all workers in the state were engineers and 2.9% were technical workers.) Relative to the declining manufacturing industries in the state, the chemicals and electrical and electronic equipment industries also have a relatively large share of managerial, professional, and technical jobs. Administrative support occupations are also a larger share of employment in these industries. The chemicals and electrical and electronic equipment industries have a lower proportion of employment in skilled production jobs than the motor vehicle and fabricated metal manufacturing industries in the state; they do, however, have many more jobs in these skilled areas than do the relatively fast-growing nonmanufacturing sectors.

Table 19 lists the 25 largest occupations in these three "high technology" industries in Missouri.* These occupations comprise over three-quarters of the total employment in these three industries. In 1980 over 1,000 workers were employed in these industries in the state in each of these occupations. Clearly, training for several of these occupations, such as secretaries, welders, electricians, technicians, machinists, and custodial service occupations, can be provided by the vocational and technical education network.

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*The occupational distribution of employment in the relatively small, but rapidly growing, instruments industry in Missouri is not available.

Facilitating Structural Change

Shifts in demand and output from older industries to newer technologically more advanced ones are inherent in the dynamics of production and economic development. The entry and exit of firms and industries destabilize labor markets as skill needs shift from declining to emerging sectors. Failure to adapt to structural changes can result in pockets of unemployment, skill shortages in growth occupations, and slower economic growth overall.

The vocational and technical education network can facilitate structural change by adapting to the diverse and evolving skill needs of an area. Monitoring growth and decline over the course of industrial development, however, can be hard. Anticipating new and emerging labor market needs is especially difficult, and employment projections are not likely to help in this regard. The focus on preparing workers for "high technology" industries, in particular, accentuates the need for education and training policy to recognize and adjust to the dynamic nature of production processes.

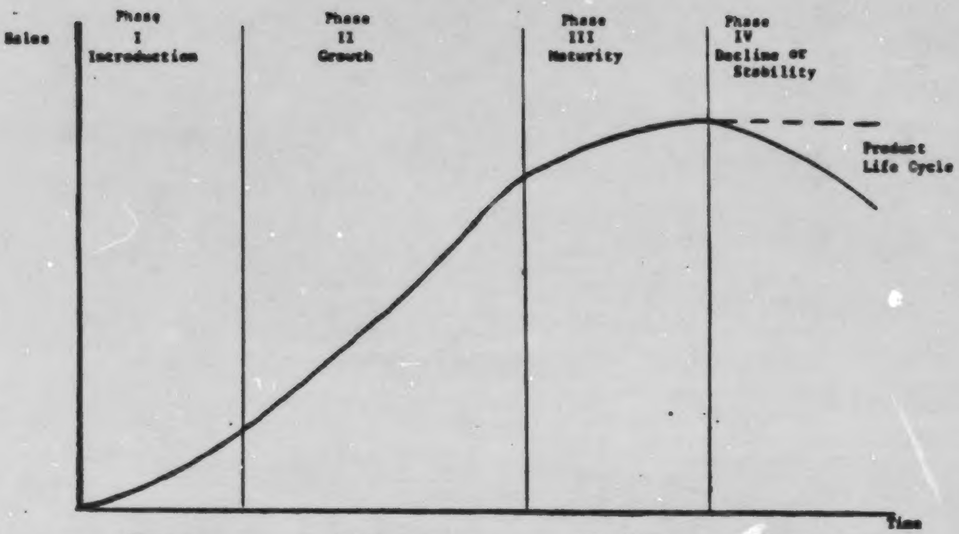
Production Life Cycles and Employment. A number of recent studies have focussed on the process of industrial birth, spurts of growth, maturation and decline.[9] The concept that industries pass through a series of stages during their development, however, dates back to the 1930's, when industries were found to undergo a sequence of stages -- experimentation, rapid growth, diminished growth and stability or decline -- during their industrial "life".[10] More recently, separate "life cycles" have been delineated for products, for production processes and for technologies.[11] Each of these cycles traces various production relationships within the course of overall industrial development.

Production life cycles affect both the level of employment and the occupational mix of jobs available in an area. Initially, production takes place in close proximity to research and development (R & D), as engineers and scientists experiment with product and process design. The introduction of new technologies, therefore, contributes to production jobs at the R & D location. At later stages of development more stable production techniques and standardized equipment permit the separation of R & D from production. Production activities can be transferred to lower cost regions and countries, as technologies and products mature and competitive advantage increasingly becomes a function of unit production costs.[12]

Industrial development also affects the skill mix associated with a given product. (See Chart 2.) During the experimentation phase, engineers and scientists are needed to develop new technologies, construct pilot models and implement design changes. Initially, these professionals perform most of the tasks later assumed by production and marketing managers, technicians and skilled crafts workers. In

CHART 2

PRODUCT LIFE CYCLE



Characteristics	Phase I	Phase II		Phase III	Phase IV
Process	Job Shop; Batch Production	Short Production Runs →	Automated Mass Production	Mass Production	Mass Production
Equipment	General Purpose	General Purpose →	Specialized	Specialized	Specialized
Dominant Labor Input	Highly Skilled Scientists & Engineers	Engineers & Technicians →	Technicians & Semi-skilled	Semi-skilled & Low-skilled	Semi-skilled & Low-skilled
Job Skills	Firm Specific	Firm Specific →	More General	General	General
Skill Training	Acquired at the Work	Shifts to the Schools		Shifts within the School Network	Varied Training Sites; Focus on Replacement Needs and Retraining

Source: Patricia M. Flynn, "Production Life Cycles and Their Implications for Education and Training, A Study of High Technology in Lowell, report prepared for the National Institute of Education, February 1984.

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addition, the relatively short production runs and general purpose equipment that characterize the earlier stages of product development require skilled set-up and maintenance workers. Subsequently, the diffusion of technology and large-scale production permits more routinized tasks requiring less-skilled workers who monitor and control of the machinery. Product assembly can be done by low-skilled and unskilled workers who concentrate on a very limited number of specific tasks.[13] Skills, once embodied in the workforce, are transferred to the production equipment. The maturation of both technology and product, thus, triggers a "jobs cycle" which implies a declining ratio of highly skilled workers to semi-skilled and low-skilled workers.

The "Training Cycle" in Occupational Preparation. Production life cycles, in general, and the "jobs cycle" in particular, suggest a "training cycle" in occupational preparation.[14] On-the-job training and workplace training programs are relied upon to produce the skills required by the introduction of new technologies. The scientific and engineering staff initially teach others what needs to be done for production in small batches. In addition, the skills necessary to operate production equipment that has been custom designed for a specific company must also be acquired at the work site; the manufacturer of the equipment often provides this training.

When a technology becomes more widely adopted and equipment standardized, skills that were once "firm specific" become "general" skills that are transferrable among employers.[15] Because employers cannot capture the return on investments in "general" skills, they prefer to shift "general" training out of the factory and into the schools where it will be paid for by the government or by individual students. Moreover, as demand for such skills increases, it is easier to formalize the training and provide it in the schools. Together, these two forces encourage the shift of skill development from the factory to the educational system during the middle stages of the production cycle. Keypunching, word processor training, and the set-up and operation of various numerical control equipment are classic examples of this transfer.

If demands for the skill continue to grow, training becomes diffused among a wide range of educational institutions. Finally, as the industry declines and demand for these skills contracts, training focuses on meeting the replacement needs of firms and on retraining workers for employment in other fields. Training may be spread in haphazard ways among various educational institutions as training pressures gradually diminish.

Because "training cycles" are derived from product and process life cycles, they will vary by product and by industry and even by firm.[16] The existence of training lags, and the diversity of mission and constraints among educational institutions suggest further variation by occupation and by local labor market.[17]

Training for the High Technology Sector

As the discussion of production life cycles above implies, the concept of a "high technology" industry is misleading. "High technology" is a dynamic and relative concept that describes a phase of industrial development. Industries, or components thereof, pass through "high technology" phases -- characterized by rapid technological change, a relatively high degree of R & D expenditures, and a dependence on highly skilled workers. While the textile industry is often referred to as "mature" or traditional today, it represented a "high technology" industry a hundred years ago. Similarly, industries considered "high technology" today, such as computers, biotechnology, information processing, and robotics may or may not be the "high technology" industries of tomorrow.

While "high technology" industries are identified in part by their dependence on highly skilled professional and technical workers, blue collar and clerical jobs continue to account for the majority of the employment in these industries. Furthermore, if "high technology" employers pay better than nonmanufacturing and the more traditional manufacturing industries in the local area, skill shortages attributable to the influx of "high technology" firms appear in the "non-high technology" sector. This is particularly true in the blue collar and clerical fields.

Training for "high technology" industries requires a comprehensive policy that addresses a wide range of occupations and focuses not only on the needs of the fastest growing, new industries, but also on the needs of the industries and firms that "feed" into the "high technology" sector. "High technology" policies must be designed to accommodate decline as well as growth, small firms as well as large, and a variety of industries that are likely to change over time.[18]

Training for the subset of "high technology" jobs that involve new and emerging skill needs, frequently takes place outside the formal school setting. Working in an environment of rapid technological change and innovation, highly skilled engineers and scientists determine occupational requirements at the workplace on a trial and error basis. Schools cannot hope to prepare workers for specific job skills needed in companies operating at the "cutting edge" of new technologies. However, as a technology develops and as demands for new skills expand, skills become more generalized and transferable among employers. Training can then be formalized and should be transferred to the educational institutions. This skill transfer process requires close, continuing collaboration between educators and employers.

SECTION IV - QUESTIONS AND RESPONSES

1. What data sources best depict the current and projected labor market needs which vocational and technical education could assist in filling?

   Various U.S. Census data -- see Tables from Sections I and II for the kind of data available. See text on how it is useful.

Missouri Division of Employment Security data on employment by industry and staffing patterns. Employment projections for the state and those developed for substate areas.

Various data on turnover, average hourly wages, annual earnings, fringe benefits.

Data on plant expansions and openings.

MOICC Data Books.

Plus less quantifiable information on employer hiring and staffing patterns by firm size, industry and occupation.

Placement and follow-up data on vocational and technical education graduates.

2. What are the current labor market needs as indicated by appropriate data sources?

   See Section I.

3. According to the data sources identified, what are the projected labor market needs for the State of Missouri?

   See Section II.

4. Which occupational areas appear to have the greatest growth potential and which are expected to experience the most rapid decline?

   See Section II, especially Tables 12 and 13.

5. What "high technology" occupations hold the greatest promise for program development in vocational and technical education?

   See Section III, especially Tables 18 and 19.

6. What measures can be taken in preparing and presenting labor market needs data to insure their use in the planning of vocational and technical education programs?

   Discussed with the Advisory Committee.

SECTION V - RECOMMENDATIONS

The attainment of Goal I, the determination of which "current and projected labor market needs of the State of Missouri can be met appropriately by the state's vocational and technical education delivery system with available and anticipated resources," requires an assessment of the vocational and technical curricula and trends (under Goal II) and educational finances and resources (under Goal III) in light of the labor market needs.

Based on background materials gathered under Goal I and Goal II, for instance, the Advisory Committee should be able to pinpoint potential problem areas and situations that currently call for change: Where have training programs been growing relatively fast but employment in related occupations grown relatively slowly or declined? Where have programs been growing relatively slowly or declining, although employment in related occupations has been above average? For which occupations projected to grow quite fast, are training programs not currently available? Which training programs have low rates of placement in field? Why? What is the distribution of male and female students among training programs and does this reflect (and perpetuate) the current labor market patterns by sex?

It would also be useful to know what types of jobs vocational and technical graduates have acquired in the past; does this vary by educational level; which firms and industries hire graduates from the various training programs; and which employers hire students through cooperative education programs.

The reality of limited resources (Goal III) for vocational and technical education programs focuses attention on the need for the Advisory Committee to establish priorities, recognizing that trade-offs are inevitable.

The following policy recommendations for education and training arise from the labor market analysis.

Vocational Education and Economic Development. The state of Missouri, as well as many other states in the country seeking to attract employers and industries, is advertising "tailor-made" work-forces to accommodate individual employer needs. The following are excerpts from the Missouri Corporate Planner:

> "The Division of Career and Adult Education will send a team of industrial training specialists to study the company's operations, production processes and needs, and required job skills. Then, working with the local school system where the company is located, the staff will help the empoyer develop a curriculum, and customize a comprehensive training program." (p. 37)
>
> "When the initial training period is over, Missouri's Customized Training Program can provide assistance to companies needing help with new products, processes, or equipment. Classroom and skill training can be conducted to insure a continuous supply of trained labor. A company's workers can be retrained, and their skills upgraded. Area vocational schools can provide continuing education programs." (p. 40)
>
> "Through monies provided under the federal Job Training Partnership Act (JTPA), additional funds and training assistance are available to aid companies in meeting their employment and training needs...." (p. 40)

While it is important for vocational and technical education programs to be flexible and have the capacity to train workers for specific jobs to meet individual employer needs, the focus should be on providing skills that are transferable among different workplaces, guarding against providing training that is extremely narrow in scope. Youth, particularly at the secondary level, need education and training that is broad enough to enable them to work in a variety of work situations and to adjust to structural change over the course of industrial development.

Vocational and technical education policy must be sensitive to the distinctions between short-run and long-run labor market conditions and have the capacity to serve both situations in order to satisfy the economic development needs of a region. Under the immediate pressure of unfilled jobs, it is important to be able to quickly implement programs to expand the supply of trained workers for employers with immediate staffing difficulties. However, ample evidence suggests caution against rapid installment of programs to build up skill supplies unless the manpower gap is large and continued demand can be demonstrated.[19] Policy should address not only the existence of skill shortages but also such issues as how fast scarcities can be met and at what risk of eventually stimulating surpluses.

Rates of pay of prospective jobs of graduates should also be considered prior to initiating training programs. A low-cost, low-skilled supply of labor may delay the exodus of local manufacturing jobs involving simplified production tasks. Vocational and technical education should focus its limited resources on the more skilled and better paying jobs thereby providing a trained workforce that will, in turn, attract better jobs to the state.

Vocational Education and Equity. The determination of i) labor market needs and ii) the vocational and technical training programs that can appropriately address these needs should precede discussion of iii) servicing target groups of the economically or physically disadvantaged. After i) and ii) have been determined, the vocational and technical community should figure out what steps and resources are required to provide individuals in targeted groups with the credentials and skills required for access to these jobs. If remedial assistance is deemed necessary, vocational educators should work with the appropriate agencies/institutions to see that it is provided.

Sex integration in vocational and technical education programs needs to occur in both directions. Females should be given training to enable them to be competitive with males in seeking the better-paying, higher-skilled jobs in the state. In addition, given that the sectors of fastest employment growth in the economy are those in which females traditionally predominate, males, if they are to find employment in the state, must be encouraged to enter educational programs that provide training for these occupations. (The entry of males into the fast-growing, nonmanufacturing sectors will probably raise average earnings in these occupations.)

Vocational Education Planning and Program Evaluation. The diversity among employment patterns in the state's fifteen service delivery areas (SDAs), designated under the Job Training Partnership Act (JTPA) of 1983, emphasizes the need for local labor market analyses to supplement statewide data in order to determine vocational and technical education programs consistent with local labor market needs. This is particularly important, since research to date, indicates that most occupationally trained graduates below the four-year college degree level find employment in their own community or local labor market area.[20]

Educators essentially need the equivalent of a "business analyst" to gather and interpret local employment data and skill requirements.[21] The Private Industry Councils (PICs) mandated under JTPA should serve in this capacity and educators should work closely with the PIC's to develop appropriate training programs.

With respect to the evaluation of individual training programs, in addition to placement rates, data on longer term earnings, fringe benefits, turnover and upgrading, as well as "less quantifiable" information on advancement potential should be used as criteria in determining "success".

Facilitating Structural Change and "High Technology". Schools cannot hope to prepare workers for specific job skills needed in companies operating at the "cutting edge" of new technologies. However, skill training should be transferred to the schools as skills become more generalized and transferable among employers. Small scale experimental programs facilitate this transfer of new and emerging skill training to the schools.[22] Rental equipment is recommended for such programs, rather than large capital outlays that may hinder future flexibility and prohibit future investments in new, improved, cheaper and standardized models of equipment.

The federal government is a likely candidate to be the "sponsor" of such experimental programs in that it can coordinate the programs nationwide, minimize duplication and provide for widespread dissemination of the results. However, recent declines in federal spending on education suggest the need for states concerned with meeting the needs of "high technology" to take the initiative in financing these experimental programs or in developing mechanisms that encourage a flow of private sector funds for this purpose.

State-wide proposal competitions, as opposed to the distribution of such monies by formula, coupled with strong monitoring and evaluation, can best provide for "venture capital" for experimentation.

Industrial development, structural change and the likelihood of worker dislocation suggest the need for a skill retraining capacity even during prosperous periods. In addition, technological change hastens skill obsolescence, thus intensifying the need for programs enabling workers to update their skills. Retraining and skill updating programs should be available at all skill levels and should be arranged to complement work schedules.

The Distribution of Training Responsibilities. Within the vocational and technical education network, the Advisory Committee should work to allocate educational and training responsibilities among the various types of institutions given their divergent missions and capabilities. Vocational and technical educators, however, cannot and should not be expected to provide training for every employment need. Vocational educators should work with business, union apprenticeship programs, government training programs, the military and other educators to determine the institutional mix that best meets the needs of the workers, as well as the employers, in the State of Missouri.

Further Study. In addition to long term structural changes, the Missouri economy is affected by large cyclical swings in manufacturing, particularly in the transportation equipment industry. In-depth study should be made into the initial and spillover employment effects of the relatively large transportation equipment industry in the state. Of particular interest is the impact of the cyclical volatility of the automobile industry on employment, training and retraining, and unemployment in Missouri.[23] The political vulnerability of the rapidly growing aircraft industry in terms of the defense budget and the availability of R & D funding should also be addressed.

Other issues not discussed in this paper but which should prove helpful in guiding vocational and technical education changes in the future include: the relationship between firm size and the use of vocational and technical education in Missouri;[24] the degree of transferability of various vocational and technical skills among employers and industries; and the preferences of employers for secondary, post-secondary and adult graduates by area of training.

GOAL II: DELIVERY SYSTEMS

This section of the paper is designed to focus upon the delivery system that currently exists in Missouri and to make recommendations to strengthen that system. To preface the findings and recommendations, this section of the paper will provide an overview with respect to the delivery systems for vocational education in other states as well as the primary dynamics of the society that influence the nature and scope of vocational education. The next section is designed to provide a description of the vocational education delivery system in Missouri. Section three addresses several significant questions which were identified by the 1984 Vocational Study Committee, and the final section presents a series of recommendations to be considered by the committee. (See FINAL REPORT for recommendations finally adopted.)

SECTION I - OVERVIEW

Even though the concept of vocational education can be traced back for centuries, the foundation for today's system of vocational education is, perhaps, only a century old. As we approach the twenty-first century, we find much [illegible] the philosophical foundation that undergirded vocational education in the early 1900's still in place across our country.

Meanwhile, the social, business, agricultural, and industrial structures that created the system have changed dramatically. These changes have impacted the workplace and the role of the worker.

What was quite effective and acceptable in the early through mid-1900's is less than ideal as we work through the final decades of this century and beyond.

To illustrate this point let us consider one area of vocational education's interest, the transportation field. Transportation, the means of going from one place to another has changed dramatically.

The fastest one could move across land for any great distance in 2000 B.C. was about 8 mph. That was by camel. In the mid-1600's A.D. when the stagecoach was introduced, an average speed of 10 mph was common under good conditions. In 1826 a locomotive called "rocket" recorded a speed of 29 mph, with an average of 13.8 mph from Liverpool to Manchester, England. In the early 1900's the automobile came to be. Creeping at first at less than 20 mph, cars can now achieve speeds of over 200 mph.

Airplane transportation, the current ultimate in long distance travel, began with a sputter around the turn of the century; however, recently the government unveiled its newest aircraft with a capability of traveling two times the speed of sound. It took from the beginning of time until fifty years ago to get us to, at best, 100 mph, and now rockets are capable of taking us over 6½ mps to the moon, Venus and other planets and galaxies. What once was a Buck Rogers' fantasy is now a reality!

Change in transportation has been dramatic and so have the changes experienced in agriculture, electronics, marketing and all other areas with which vocational education is concerned. However, viewing educational issues on a national basis and then translating those views to local application is hazardous at best. It is wise to view the country as a whole and sensitize ourselves to some primary national issues facing vocational education and the ways in which other states respond, not for duplication purposes, but rather to gain new insights and a broadened perspective.

Over the past thirty years education has been primarily a reaction-oriented system as illustrated by the following:

---- 1950's produced Sputnik. The response was a tightly organized curriculum with a heavy math-science-technology orientation. National Science Foundation and Merit Scholarships were plentiful to deserving students, and research dollars found their way to our nation's technically oriented universities.

---- 1960's saw our students rebelling and protesting on college and secondary school campuses. Our response was a loosened curriculum with options - an open environment - team teaching - independent study.

---- 1970's brought a call heard nationwide of "back to the basics". The response was a narrowing of focus in curricula and a lessening of student impact on the curricula.

---- Now in the '80's international competition has reared its head and several countries are challenging the USA's supremacy in technology. Our response could be a modified swing to the 1950's technology-driven goals with a strong measure of the basics of writing, reading, and, perhaps, an emphasis on responsibility skills.

Whatever the specific response is nationally, one thing is certain, vocational education must respond to the existing and projected needs of its clientele.

In the 1980's several major social and economic issues have been identified as national in scope and relevant for review by educational, business and other leaders.

According to John Naisbett, author of Megatrends, a major issue that exists today and should impact vocational education planning is the apparent move of our strong industrial society toward an informational-based society. Informational occupations are those involved in the creation, processing, and distribution of information, including work done in banks, stock markets, insurance companies, education and government.

In 1950, 65% of people employed in the United States were in the industrial sector. In 1984 the percent is approximately 30% -- a dramatic change. To what extent have vocational education programs reflected that change? In 1950, the number of people in the information processing sector of the society was 17%, and now that figure exceeds 55%.

Today, the mass communication systems that were created, which were in line with the industrial society, may be out of tune with the times. In the 1800's, the fact that 90% of the labor force was involved in agriculture dictated the societal arrangements of the day. In the first half of the twentieth century the fact that most of the labor force was involved in production occupations that dictated the arrangements of a mass industrial society -- which is out of tune with the new informational society. In 1950, with 65% of the work force in this country in the industrial sector, more than 30% of the workers were members of unions. The percent of the workforce that now belongs to unions is 19% and is projected to be smaller and smaller, as we move further into the informational age.

How has vocational education responded to these changes? A tremendous challenge faces vocational education. Whether our system is up to meeting these challenges is to be determined by how well vocational educators address the trends of the future and how well we let others know about our efforts.

So as we witness the move from an industrial to an informational society we must understand that business as usual will not suffice.

David T. Kearns, President and Chief Operating Officer of Xerox Corporation, in a speech to an American Business Press Meeting in Boca Raton, Florida, said:

> "I wonder why it hasn't occurred to any of us -- in government, industry or academia -- that we are trying to reindustrialize what is no longer an industrial society. We are talking about putting people back to work in our factories when the factory is being replaced as the underpinning of our economy.
>
> Right now, 22% of our nation's workforce is employed in manufacturing. That figure will drop to below 10% by the mid-1980's. I'm not saying we don't need more modern plants, better technology, and more productive factories. I'm saying that the automated factory of the future -- with functioning robots and computer-assisted design and manufacturing -- isn't going to provide enough jobs for the people who want them.
>
> To give you just one example, General Motors says that within five years, computers will control 90% of their production machinery.
>
> Let's face it. Automation does eliminate jobs. But automation does not put people out of work. That's an important

> distinction. The jobs automation eliminates are old jobs in old sectors. Automation creates new jobs -- and more of them -- in new sectors of the economy."
>
> President Kearns goes on -- "As manufacturing becomes more automated, workers will have to shift to new jobs in the information and service sector. That includes banking, insurance and real estate, hotels, restaurants and airlines, medicine, law and engineering, data processing, publishing, broadcasting, newspapers, and many others.
>
> During the past decade, the information and service sector grew an incredible 365% -- more than six times faster than manufacturing. Today, 7 out of 10 American workers are employed in that sector. It's expected that it will continue to grow and generate new jobs. And most of those jobs will require special skills.
>
> The Federal Bureau of Labor Statistics just completed a study on the fastest-growing occupations during the next ten years. The study found the greatest demand will be for computer and office machine service technicians, computer programmers and computer operators."

There is little doubt that as the foundations of the industrial age further erode, it will be up to local and state vocational leaders to move from a curriculum based on the tower of an industrial society to one that is more relevant and forward looking.

Another trend that has attracted headlines in the nation's major newspapers and magazines is the movement of high technology into the industrial and business sectors. Today your friendly soda machine says thanks and come again and your neighborhood banking machine helps you make it through the weekend. There are a multitude of helping hands all around you each day, and the age of this high technology is just beginning. Companies all over the nation are using robots to do the work of human hands. Vocational educators must gear their programs to address the needs of the little and sometimes not so little creatures that have eliminated and will continue to eliminate some of the hands-on production jobs.

Some futurists feel that this high technology change will occur quickly, perhaps in as little as three to five years. Consider the world automobile market in the 1940's, 50's, 60's, and even the 1970's. The U.S. was the primary deliverer of automobiles stateside. Now there are nearly 90 countries that have automobile assembly plants. Japan takes thirteen man-hours to build a car, while in the U.S. it takes about thirty man-hours to do the same job. This is not just reflective of worker productivity, but is caused by the use of outmoded equipment and obsolete processes. The workplace is constantly changing, and vocational educators must be able to change also.

To address these factors, as well as many others, federal, state, regional and local public vocational education programs have been created. However, these are not the only programs that serve the business and industrial community of the United States of America.

Vocational Education - Multi-Billion Dollar Business

There is no single system of vocational education in America today. Private employers spend in excess of $30 billion a year on their own training programs. Many of these dollars are spent on the type of skill development that could be considered vocational training.

Federal departments including Agriculture, Commerce, Labor, Defense and Education also combine to invest billions of dollars in vocational education programs. This strongly supports the statement that on a national perspective, vocational-type education is a very big business.

Narrowing this very broad scope of vocational education down to the public sector, and primarily to the existing educational system, the scope becomes somewhat more understandable. However, public vocational education is still a multi-billion dollar national business, and the system is quite complex.

Current Systems of Vocational Education

Few, if any, aspects of education are as misunderstood as vocational education. It is easy to see why. No area of education is more complex, and none has changed as substantially as vocational education has over the past two decades.[25]

Every state and territory provides vocational education to its citizens. The structure, organization and extensiveness varies, as does its impact within the educational system. Table 20[26] shows the variance among states in even the most popular traditional delivery systems.

Bottoms and Copa, in their paper, A Perspective on Vocational Education Today, describe each of these institutional types. (See Table 21.)

The commonalities among the various states and territories are few. The quality of programs varies from state-to-state, district-to-district, school-to-school and program-to-program. The similarities that do exist are found in mission, goals, and objectives statements. Beyond that, Woodruff[27] points out that there are in America today:

- Ten different state governance structures
- Five different types of state administrative agencies with varying responsibilities for vocational education
- At the local level at least six types of institutions in each state
- Thirteen kinds of program administrative structures
- Four types of single and multi-district services
- Regional delivery systems involving as many as eight separate agencies and five separate governing boards

This would lead most people to the conclusion that on the national level there is a great deal of disorganization. Before those conclusions are reached, it must be noted that these figures represent the summation of all data collected from various states and territories. Critical observations must only be made after thoroughly examining the system in each of the states.

These systems vary widely from state-to-state. Most states have designed their systems to meet the needs of the service deliverers on the local or regional levels.

It is on the local level where the primary training is delivered. It is here where the citizens of America should be, and in many cases, are being trained and retrained for the world of work.

All of our resources must be focused in the classroom or the training situation. Federal, state and local staffs must work to support this delivery of services. It is only through this type of support that vocational education can be designed to meet the needs of the communities and businesses.

SECTION II - THE MISSOURI SYSTEM OF VOCATIONAL EDUCATION

To gain a clear insight into the delivery system for vocational education in Missouri it is necessary to understand the philosophy and goals that guide the state level organization and the physical structure of the area vocational system.

Philosophy and Goals

In order to provide overall system direction the State Board of Education has adopted Philosophy and Goals statements. The following are both of these statements as found in the 1984 Missouri State Plan for Vocational Education:

MISSOURI PHILOSOPHY ON VOCATIONAL EDUCATION

THIS WE BELIEVE

THAT every individual should have equal access to vocational education regardless of race, creed, sex, socio-economic status, or place of residence. Every person in the state of Missouri should be provided vocational education opportunities so they can achieve the fullest measure of their physical and mental abilities.

THAT every individual should have access to quality programs of vocational education which will provide the skills and knowledge necessary to enter and progress in an occupation. Persons who have already entered the labor market should have available to them vocational counseling and placement services in addition to occupational upgrading.

THAT every individual should have an opportunity to develop positive attitudes toward the social significance of work and should be provided experiences which will develop and expand occupational aspirations.

THAT persons of all ages should be provided with opportunities to further their personal career development through a variety of activities. Career development activities should provide information and experiences which lead to understanding of the significance of work and to occupational awareness.

A statement of philosophy should be broad in scope and designed to identify general beliefs and establish general working parameters. All actions, activities and expenditures should be judged against the question, "Is this action, activity or expenditure within the limits of the State Board's philosophy?". Missouri's statement of philosophy is quite broad, as expected, and written with enough clarity to define limits and express their belief. These philosophical statements are to be the destination towards which vocational educators are constantly moving.

The precise vehicles that are to be used in that quest are the annual goals. Each goal should, when successfully reached, bring vocational educators closer to our philosophical destination. The following are the FY 1984 Goals for Vocational Education in Missouri:

DEPARTMENT OF ELEMENTARY AND SECONDARY EDUCATION
DIVISION OF CAREER AND ADULT EDUCATION

GOALS FOR VOCATIONAL EDUCATION

1. Provide vocational programs and services for secondary students, commensurate with labor market demands.

2. Provide vocational programs and services for persons who need postsecondary education, commensurate with labor market demands.
3. Provide vocational programs and services for persons who need adult education, commensurate with labor market demands.
4. Provide vocational programs and services for disadvantaged and handicapped persons.
5. Provide a program of pre-service and in-service vocational education for professional personnel development.
6. Provide leadership opportunities for the future development and continued growth of the Missouri program of vocational education.
7. Provide administrative, ancillary, and other supportive services to enhance the quality of vocational instruction program efforts.
8. Provide opportunities for research and development programs, for exemplary programs and for related research activities to improve the quality of the Missouri program of vocational education.
9. Provide equal access to vocational programs, services, and activities for all individuals regardless of their sex, race, color, national origin, or handicapping condition.

Each goal has targeted one or more of the philosophical statements. Both the philosophy and goals statements are included in the state plan to let the federal government know the intention and directions of the State Board of Education. The state plan is an agreement with the federal Department of Education describing the board's intentions regarding the use of federal, state and local funds. This plan identifies the specific objectives and activities to accomplish the stated goals.

The State Board of Education's administrative arm is the Missouri Department of Elementary and Secondary Education. Within this Department exists a Division of Career and Adult Education. It is this Division which has the responsibility for administering all

Federal and State laws concerning vocational education. The chief administrative officers of the Department of Elementary and Secondary Education are the Commissioner and Deputy Commissioner. The primary administrator in the Division of Career and Adult Education is the Assistant Commissioner and State Director of Vocational Education, who reports to the Deputy Commissioner. The organization of the Division of Career and Adult Education - Vocational Branch can be seen in Appendix I. Each of the identified units are professionally staffed and their primary responsibility is to carry out the State Board's philosphy and goals for vocational education. This staff works closely with other state governmental entities, local businessmen and local educators to cause improvement and excellence in vocational education.

In order to see a clearer profile of Missouri's educational system a move from the general state level of organization, philosophy and goals to a narrower and more detailed analysis is necessary.

Elementary/Secondary Education

Approximately 940,000 students attend Missouri's public schools. Public school kindergartens are available in over 520 districts. Many communities have alternative educational programs available through private and parochial schools. Quality instruction is maintained through comprehensive programs of evaluation, classification and accreditation by the Missouri Department of Elementary and Secondary Education, the North Central Association, and the Committee on Accredited Schools (Non-Public).

Higher Education

Since its earliest days, Missouri has been a pioneer in providing opportunities for learning. The University of Missouri was established in 1839. It is the oldest state university west of the Mississippi River. From modest beginnings, the University has grown to include four campuses of more than 50,000 students. More than 10,000 degrees are awarded each year at undergraduate, graduate and professional levels. The University is among the largest in the United States, in terms of both enrollment and number of alumni.

Its research program is one of the nation's largest, with annual expenditures of approximately $50 million.

Annual enrollment in Missouri's colleges and universities averages over 200,000. (See Table 22.) Approximately 30,000 students receive degrees each year. Missouri ranks 8th in the U.S. in number of colleges and universities; 85 percent of all Missourians have a college or university within 30 miles of their home.[28]

Vocational Education

Vocational education enrollment has shown a steady increase of about 12 percent per year over the last decade. Over 250,000 students are currently in various phases of vocational training in the state. The cost of this training has been estimated at over $100 million per year.

Total funding for vocational education in Missouri has increased by 25 percent in recent years. The state now spends three times more to support vocational education than it did a decade ago.

A recent study is indicative of the success of Missouri's vocational education programs. In Missouri, 96 percent of the persons available for employment following completion of a vocational education program were placed in a job, compared to a 90 percent rate nationwide.

Area Vocational Schools

With a school system of over 50 area vocational schools (See Appendix II) throughout the state, training can be provided efficiently and economically at nearly any location in Missouri. Ninety-five percent of Missouri residents live within 25 minutes of a vocational-technical school.

Missouri's vocational education system offers coursework in six major occupational areas and over 100 subareas.[29]

The scope of each of these major areas is provided in Appendix III so that you might more clearly understand the complexity of each enrollment area. Table 23 shows a summary of projected enrollments for FY 1984.

Appendix IV shows that Missouri has an extensive vocational program offering.

A review of Appendix IV shows that the programs offered are the traditional offerings that are available from state-to-state in the U.S.A. The majority of these offerings are the necessary foundation for a very solid statewide vocational system.

In the Introduction and Section I of this paper the point was made that vocational education must be dynamic if it is to be current and must change as the needs of business and industry change. Missouri's system would appear to be able to do just that. Appendices II & IV show the distribution of Area Vocational Schools in Missouri and the programs available at each location. As can be seen in Appendix IV, there are some areas of the state that have limited program offerings while other areas have substantial program offerings. Obviously, proximity to population centers has a lot to do with the number and types of programs available to residents. (The determination of whether these are the correct programs for each locale or whether some programs should be added or deleted from the Area Vocational Schools are beyond the scope of this project.) It is possible to make size and program geographical location comparisons from the information provided.

An analysis of the comparative size data enables a combining into four separate size groupings as seen in Table 23.

The data show that there are a significant number of large and very large area vocational schools in Missouri, no small, and only eight medium-sized schools. The map in Appendix II shows, as should be anticipated, the majority of very large schools in Missouri are in the metropolitan areas of St. Louis and Kansas City. These data, when compared with 1975 data, show significant growth and obvious commitment to vocational education by decision-makers in Missouri.

In addition to what the local education service deliverers do to meet the needs of business and industry, the Division of Career and Adult Education has created a quasi-system of delivery called Industry Training Projects. This system is designed to be responsive to business and industries' immediate needs. There are many types of service deliverers in Missouri giving the total delivery system for vocational training a great deal of potential. Examples and descriptions of these service deliverers are in Table 21. Table 24 shows the number of each of these service deliverers in Missouri.

In addition to regular programs offered within the school systems, the Department of Elementary and Secondary Education's Division of Career and Adult Education, in cooperation with other State agencies, has designed a quick response system to meet the needs of new and expanding businesses in Missouri. The final product of this Industrial Training Project will be a tailor-made training program customized to meet the needs of the new or expanding company. This type of program is not unique in the country, but the high degree of cooperation between agencies and business and industry would serve as a good example for other states.

Finally, a situation currently exists in Missouri that needs immediate attention. The situation is this: area vocational schools are created to serve the areas in which they are located. They normally serve several sending districts. These districts determine how many students, if any, will be able to participate in the area vocational school programs. They determine this by financial constraints and other considerations, including where vocational education is in the district's priorities. These decisions are made annually, thus creating an unfair planning problem for the area schools and showing no long-term commitments to vocational-technical education. This problem must be addressed.

SECTION III - QUESTIONS AND RESPONSES

There are several questions that need to be addressed before recommendations can be made. Those questions and their respective responses follow.

Question 1

What is the current delivery system of vocational and technical education in Missouri, including types of institutions, mix and level of programs, as well as, numbers and types of students by geographic area?

Response

Vocational education programs are offered to Missourians through four separate delivery systems:

- Area Vocational Schools
- Comprehensive High Schools
- Junior Colleges
- Four-year Institutions

A detailed analysis of their enrollments can be found in Appendix V.

Question 2

What are the major strengths and weaknesses of the Missouri Vocational and Technical Education delivery system?

Response

During the process of writing this paper several major strengths and a few weaknesses have been identified from the materials reviewed and interviews that were conducted.

Strengths

1. A significant increase in program implementation has been made since the mid-1970's. This indicates strong local and state support.
2. There are a number of very large (more than 20 programs) Area Vocational Schools that offer an excellent variation of programs.
3. The location of area vocational schools seems to be spread throughout the state with every major population center being served well.

4. The Industrial Training Project is well conceived and has experienced several very successful projects.
5. The Missouri Department of Elementary and Secondary Education's (DESE) Division of Career and Adult Education is organized in a manner that will serve the local service deliverers well.
6. The application process for expanding and new regular vocational programs is very good. (See Appendix VI.)
7. Local Advisory Committee involvement is evident in programmatic decisions. (See Appendix VII.)
8. The DESE - Division of Career and Adult Education has a flexible yet well-defined program termination procedure. (See Appendix VIII.)
9. The DESE - Division of Career and Adult Education, together with State Universities and local Education Agencies, promote and support vocational student organizations. (See Appendix IX.)
10. Missouri has thorough certification requirements. These requirements appear to be clearly written and are capable of being monitored. (See weakness #2.)
11. Vocational standards are being reviewed.

Weaknesses

1. There are many rural areas of Missouri that are not being served by area vocational schools.
2. Though the certification area in general is excellent, there are several points that should be noted:

a. Local Directors and Assistant Directors are required to have a Masters Degree in Education, with preparation in a vocational area. This will eliminate anyone with less educational credentials but more business experience. Missouri has a permanent certification for some vocational areas.

c. There is no requirement to have teachers return to the world of work for technical and procedural upgrading.

d. There is no requirement to bring teachers back into the classroom for curricular upgrading so their classes remain current.

3. The existing standards for program operation are minimal.
4. Both state and federal paperwork requirements for the local service deliverers are heavy.
5. There is no standard or criteria of excellence for program or school operation. There are minimum acceptable standards, but there are no "quality program indicators" that would encourage higher than minimal performance.
6. There is a great deal of confusion about the multipurpose need for vocational education.
7. Only limited followup data on vocational students exist. These data defines vocational education very narrowly.

Question 3

To what extent are vocational educators and other service providers meeting the labor market needs in Missouri?

Question 4

Given the most valid labor market projections, what appears to be the level and mix of vocational and technical education programs that would best meet the projected employment demands?

Question 5

In order to become better aligned with labor market needs, what adjustments should be made in programs offered by area vocational schools, comprehensive high schools and community/junior colleges?

Response 3, 4, 5

Limited by the accuracy of the supply and demand data provided, it is assumed that in some areas the delivery system is meeting the needs of Missouri's employers. However, the data provide several areas of concern.

There are several areas of major oversupply:

AREA	EXCESS
Agriculture Mechanics	1,996
Air-conditioning & Refrigeration	480
Automotive Mechanics	1,526
Automobile Body Repair	801
Welding Occupations	992
Real Estate Marketing	6,453
Cosmetology	1,500
Keypunch Operators	851
Computer Science	1,551

The information provided indicates that some people will enroll in these programs for other than placement purposes. However, these numbers do show that some schools should reduce their offerings that reflect the needs of the 1950's - 70's and look to the needs of the future. (See Appendix X.)

There appears to be a significant enrollment and demand in some technical areas; however, there is a large unmet need in marketing and business and office occupations. If, as was projected in Section I of this paper, information sector job opportunities continue to expand, a critical lack of workers in the related field would be predicted in only a few years. It would also be reasonable to suggest that many of these programs must be made available to the post-secondary student. If the predicted trend is accurate, a large number of people will be in need of upgrading and continuing education.

Question 6

What specific vocational and technical education programs should be assigned to: (a) area vocational schools; (b) comprehensive high schools and/or (c) post-secondary schools in Missouri?

Response

This question's response can be made only after a clear understanding of what the State Board feels is the role of vocational education in Missouri.

In its Philosophy on Vocational Education (see page 58) the State Board indicates that vocational education should provide every individual:

a. Skill and knowledge necessary to enter and progress in an occupation

b. Retraining

c. Upgrading

d. Vocational counseling services

e. Placement services

f. Develop positive attitudes toward work to expand occupational aspirations

g. Occupational awareness

This analysis shows that there are several levels within the scope of vocational education in Missouri. These levels can be labeled with the following titles:

1. Awareness (g)
2. Entry Level Preparation (a)
3. Retraining (b)
4. Upgrading (c)

The other parts of the Board's role should be included in any quality vocational program:

1. Counseling services (d)
2. Placement services (e)
3. Develop positive attitudes toward work to expand occupational aspirations (f)

Having identified the State Board's four levels, the next task is to ask the question, "Which of these levels belongs in the area vocational school, comprehensive high school and post-secondary schools?"

Area Vocational Schools

If an area vocational school is to be a high quality institution, all of the levels must exist, plus all of the services.

Comprehensive High School

A high quality vocational program in a comprehensive high school will have a very broad occupational awareness offering and, though sometimes limited in numbers, a small (usually less than ten) entry level preparatory program offering. The counseling, placement and attitude development services should be available.

Post-Secondary Schools

All levels should be made available to the public through the junior colleges or four-year institutions only if vocational education is a priority endorsed by the statewide governing boards in their respective philosophical or mission statements. The primary role for the post secondary schools should be focussed on advanced skill training and employer retraining and upgrading. However, there will still exist a need for entry level preparation and occupational awareness at some schools, and this need should be met.

Question 7

What criteria should be used in making decisions to initiate, continue, or discontinue vocational and technical education programs in Missouri?

Response

The State Board should adopt a set of quality indicators. Some suggested quality indicators for vocational programs are as follows:

1. Placement data (related and non-related employment)
2. Employer's satisfaction with training
3. Graduate's satisfaction with training
4. Meet labor market needs (programs not needed -- needs for employees for which no program exists)
5. Cost effectiveness
6. Up-to-date facilities
7. Up-to-date equipment
8. Teacher currency in field
9. Currency of curriculum
10. Student recruitment and selection process
11. In-service teacher development
12. Advisory Committee support
13. Administrative awareness of programmatic needs
14. Local school board support
15. Guidance and counseling services availability
16. Business and industry involvement in student evaluations

These quality indicators are examples of criteria that could be used to make decisions of whether or not to duplicate, continue or discontinue a program. The positiveness or negativeness of each quality indicator should assist in the decision-making process.

Question 8

What factors promote or inhibit improvement in vocational and technical education programs in Missouri?

Response

There are several factors that promote improvement in vocational and technical education in Missouri:

1. Public awareness of vocational and technical education
2. Business and industry involvement in curricular decisions
3. Business and industry involvement in the evaluation of potential graduates
4. Adequate facilities and equipment
5. Continuing in-service education of teachers and administrators
6. Adequate funding
7. Current instructors
8. Positive attitudes of instructors
9. Students who have basic skills before entrance into programs
10. Local boards that have displayed a commitment to vocational education as demonstrated by financial, facility, library, etc. support

Obviously, the inverse of the ten identified promotional factors will create an inhibiting situation for vocational education. Some additional factors that could inhibit program improvement are as follows:

1. Low demand for program graduates
2. Education centered vs business and industry centered
3. Limited or no placement services
4. Limited community awareness of programs

Question 9

To what degree are placement services being provided for secondary and post secondary students in Missouri?

Response

Although philosophically the State Board and the Division of Career and Adult Ed support placement services, there is not a preponderance of evidence to support this being a high priority at the state or local levels. In fact, the best job placement data are eight years old. These data taken from the Report of Task Force 1990 indicate that "60 percent of vocational students who attend comprehensive high schools have very limited job placement services."[30] Furthermore, the job placement services are provided by most junior colleges and area vocational schools. There was no mention of four-year programs in this study.

Question 10

What criteria are best applied to the evaluation of placement procedures?

Response

There are several criteria that must be used when evaluating placement procedures:

- Successful placements vs unsuccessful placements
- Placements in related vs unrelated fields
- Amount of business and industry requests for graduates
- Quality of Placement Officials
- Accessibility of placement services to both students and business and industry
- Relationship between placement officials and various employment, business, and industry organizations (i.e., chamber of commerce, industrial organizations, etc.) and associations

Question 11

What kinds of ancillary support services for vocational and technical education programs should be provided to LEA's through the MDESE?

Response

The Division of Career and Adult Education can play a significant role in moving vocational and technical education forward in Missouri. Its statewide role should include, but not be limited to, the following:

1. Disseminate state and federal vocational education funds
2. Certify vocational programs, instructors, and administrators
3. Monitor and evaluate all vocational programs
4. Create all State Plans for vocational education

5. Work with the State Advisory Council for Vocational Education to create Standards of Excellence for Vocational and Technical Education programs
6. Coordinate the statewide program for quick-start training. (Industrial Training Project)
7. Create and discontinue programs
8. Statewide placement efforts should be activated in cooperation with the State Department of Economic Services
9. Bring other states' and nations' leaders' relevant information to Missouri
10. Support research concerning vocational education
11. Coordinate statewide service area leadership
12. Support in-service programs
13. Support and coordinate business, industry and education exchange programs
14. Conduct and support follow-up studies
15. Represent the State Board and Commissioner with the Legislature
16. Assist local administrators in meeting the special needs of local business and industry

In general, the Division of Career and Adult Education should provide leadership and service, as well as, monitor and evaluate for compliance. The Division should be the leader that moves the state forward in program development and new directions.

Question 12

What should be the role of vocational and technical education in offering customized training programs for business and industry? What support services should be provided by LEA's and/or DESE?

Response

The Division of Career and Adult Education should coordinate all customized training programs. This coordination should be in conjunction with the administrative branch of the Missouri Job Training Coordination Council and local education service deliverers. In addition, the Division should coordinate closely with Chamber of Commerce, industrial development organizations, etc. to assure that they are aware of the services offered.

Vocational and technical education's role in offering customized training is quite broad. This role should include the following:

LEA

- Facility utilization
- Staff utilization
- Equipment utilization
- Cooperative program development
- Cooperative curriculum development
- Student recruitment
- Student services
- Training program delivery

DESE

- Planning assistance
- Financial assistance
- Curriculum development
- Student recruitment/assessment
- Research assistance
- Basic tool/normal machinery
- Coordination with all other state programs
- Training coordination

Question 13

What kinds of pre-service and in-service personnel development programs and activities are needed to serve the state delivery system for vocational and technical education? (staff quality, recruitment, retention)

Response

There are no simple answers to this question. However, there is a necessary understanding level that can be reached and then a few suggestions can be made.

To describe adequately the state's pre- and in-service personnel development programs and activities, one needs to know the numbers of students and the number of teachers in the statewide system. Appendix XI shows the growth of vocational enrollment and number of teachers for school years 1969 - 70 to 1984 - 85.

The state's public universities serve as a strong pre-service preparatory vehicle. The following is a compilation of current, declared majors in the identified universities.

University of Missouri-Columbia
  Agriculture - 90
  Business - 31
  Marketing and Cooperative - 62
  Home Economics - 34
  Industrial - 54
  Guidance - 31
University of Missouri-St. Louis
  Guidance - 35
University of Missouri-Kansas City
  Guidance - 32
Lincoln University
  Home Economics - 14
  Guidance - 96
Northwest MO State University, Maryville
  Business - 35
  Home Economics - 38
  Guidance - 60
Southwest MO State University, Springfield
  Home Economics - 37
  Guidance - 175

- Southeast MO State University, Cape Girardeau
  - Business - 35
  - Home Economics - 33
  - Guidance - 60
- Central MO State University, Warrensburg
  - Business - 30
  - Distributive - 55
  - Home Economics - 77
  - Guidance - 150
- Northeast MO State University, Kirksville
  - Business - 16
  - Home Economics - 33
  - Guidance - 125

The university system is nationally known, and the University of Missouri-Columbia is nationally recognized for its vocational teacher education programs.

In addition to the declared pre-service majors at each university, many in-service opportunities are offered for upgrading and personnel development. The accountability report offers 21 pages of examples of in-service efforts. These efforts represent the in-service upgrading of thousands of Missouri teachers and administrators.

The in-service personnel development programs offered in FY 82 enhanced staff quality, recruitment and retention. Though many of these offerings appeared to be "business as usual", many others are forward-looking.

To continue this "forward-looking" training the state university leadership and the Division of Career and Adult Education will need to continue to pursue programs and activities that are, perhaps, a bit non-traditional. Examples of some of these ideas follow:

1. Educational Futuring: a summer institute that might be offered in five locations throughout the state. Each week could offer a different topic, and the consultant, an expert in the field, would spend one day at each location.

2. Student Leadership Conference: During the summer between their junior and senior years, secondary vocational student leaders could be brought to a resort area and given one week's instruction in leadership and responsibility skills, as well as, information about opportunities in the world of work, including teaching as a career.

3. A two-day teacher institute could be held which would bring vocational teachers together from different disciplines to deal with issues that are generic to all (i.e., discipline, technology update, placement, motivation, etc.). Instruction might also be given to help them personally (i.e., budgeting at home, usage of the personal computer, etc.).

4. Business and Education One-Semester Exchange Programs: High quality teachers and business people would exchange positions for a semester to get a clearer understanding of what the other's needs are.

5. Placement service for teachers during the summer months in business and industry.

6. Promote a technology contest that could be addressed by schools and industry. (i.e., energy conservation, mousetrap races, etc.) Perhaps, the contest could include ideas on using the computer, robot, laser, etc. to make some aspect of work more productive or safer.

7. Business and Industry Tour Program: This program would take teachers through businesses that have a high tech flavor or some new business processes. This can be an exciting program if business is aware of your desired outcomes, and if educators don't abuse the relationship.

There are many ideas that can be generated to assist in staff quality, recruitment, and retention. Perhaps, the key is to help people believe in themselves and to take pride in being a teacher and in having a strong, personal interest in making things happen for their students.

SECTION IV - RECOMMENDATIONS

It is recommended that:

1. Labor market needs shall be a primary factor utilized by the state agency in determining the level of state fiscal support for new programs:

a. no new programs shall be established when data show an oversupply of workers in the respective program area;

b. decisions will be made to terminate programs that are not addressing the current or projected labor market needs;

c. underserved rural areas receive a priority consideration for funding and program expansion.

JUSTIFICATION:

In some schools programs are currently being offered in curricular areas that cannot be justified by labor market demand. This practice does a disservice to those individuals expecting to get a job upon successful program completion in an occupation related to the training received. It also is a disservice to the employers in other fields of work that are severely undersupplied. Finally, when funds are allocated to training in an oversupply situation, those funds are not having a maximum training impact. In a day of tight budgets and limited resources, we must maximize the local, state, and federal investment in vocational education.

2. Credit be allowed for some vocational classes to meet increased graduation requirements.

JUSTIFICATION:

Vocational classes could provide the same knowledge, skills and attitudes in which the state and local boards of education are wanting students to gain competence. This recommendation, when implemented, will recognize this and permit local boards to make their own decisions of comparability.

3. DESE regulations be altered to permit a student to have one, two, or three class periods of instruction per day.

JUSTIFICATION:

This recommendation offers substantial flexibility in scheduling for students and local vocational leadership. This change could provide local vocational administrators with the opportunity to offer creative courses in the areas discussed in recommendation #5.

It also should be noted that if implemented, opportunity would be present to abuse the system, and steps of precaution should be taken to assure that all funded programs are vocational.

4. The Department of Elementary and Secondary Education create a set of standards for vocational education. These standards should not only reflect minimum compliance but also meritorious levels of excellence. These standards should address, but not be limited to, the following:

a. Instructional excellence

b. Curriculum

c. Advisory committee participation

d. Equipment

e. Teacher certification

f. Vocational student organizations

JUSTIFICATION:

Currently, these standards do not exist. Implementing quality standards will improve vocational instruction, delivery, etc. in Missouri. Many of these improvements will be low-cost and, when combined with recommendations #5, 6, 7, and 8, will add substantially to the quality of vocational education in Missouri.

5. There be a minimum standardized curriculum for all vocational subject areas adopted by the State Board of Vocational Education; whenever 100% competency is not required, students shall be required to complete 85% of the competencies. Programs could start at the sophomore level and should include a basic core of instruction that stresses employability skills such as:

a. Evaluation and analysis
b. Critical thinking
c. Synthesis
d. Proper work attitudes
e. Problem solving
f. Reasoning

JUSTIFICATION:

A minimum standardized curriculum for all vocational subject areas will:

a. guarantee a minimum level of student competence for all graduates;
b. communicate clearly the minimum expectations of the State Board;

c. assure instruction not only in the technical areas, but also in the aforementioned topic areas;

d. the transferable skills identified in #5 are valuable to students no matter what type job they may ultimately choose.

6. DESE fund research projects that will enhance the information base related to teacher supply and demand, teacher retention, teacher recruitment, and improving the quality of vocational teaching.

JUSTIFICATION:

Today, the biggest challenges facing the vocational administrator focus on two categories: teachers and the quality of instruction. Any research that will help administrators address these two categories will help administrators make appropriate decisions and, therefore, will help improve vocational education in Missouri.

7. The Department of Elementary and Secondary Education, working in cooperation with the state's universities, develop and offer pre-service and in-service programs to instruct elementary and junior high school level teachers and counselors about vocational education philosophy and programs.

JUSTIFICATION:

a. Currently, only limited numbers of offerings are available in Missouri, and none have been targeted in recent years to the identified population;

b. Implementation of this recommendation will help students ultimately make better career decisions;

c. Implementation of this recommendation will assist teachers and counselors in providing better informed advice or counsel to their students and peers.

8. Local and state leaders consider using non-traditional delivery systems for vocational education:

a. Schools without walls
b. Cooperative programs with business and industry as well as other training agencies
c. Skill centers
d. Television/cable classes
e. Shopping mall-based operations
f. Mobile training services
g. etc.

and, that the Division of Career and Adult Education provide incentives for encouragement.

JUSTIFICATION:

A more flexible system designed to respond as efficiently as possible to business and industry's needs is needed. The addition of the non-traditional systems proposed will provide this flexibility while streamlining in many cases at a lower than currently exists cost per trainee.

9. The Division of Career and Adult Education plan and implement a multi-media public relations package that describes the Missouri vocational education story.

JUSTIFICATION:

Though there is some effort being made currently to promote vocational education in Missouri, not enough is being done. Missouri has a fine system of area vocational/technical schools, many outstanding programs, instructors, and students. These and many other highlights should be pointed out for the legislature, school boards, business and industry, other educators, general public, other leaders, and especially the students. These people need to hear and read about the quality of vocational education in Missouri.

10. Schools shall place a priority on the development of positive work attitudes, mature social relations, communications skills, and basic education requirements.

JUSTIFICATION:

This is a directive from business and industry leaders. These leaders, in survey after survey in America, rank this as one of the top three priorities.

11. Vocational education programs that have employment as a primary goal should receive no state vocational funding if their placement rate is less than 25% and should receive reduced funding if their placement rate is less than 50%. If their placement rate exceeds 80% they should receive an increased funding rate.

JUSTIFICATION:

Though the percentages were picked arbitrarily, the message here should be "If a local school board says its program is primarily vocational preparatory, then that program should be rewarded for good work and penalized for less than good work."

12. The state provide greater discretionary funds to the Division of Career and Adult Education so that tailor-made vocational programs, etc., can be used to address the existing and future needs of the state's businesses and industries.

JUSTIFICATION:

More discretionary money is needed to expand the tailored programs necessary to meet the needs of new and expanding businesses of Missouri.

GOAL III: FISCAL RESOURCES

SECTION I - OVERVIEW OF RESOURCE ALLOCATION IN VOCATIONAL EDUCATION

Vocational-technical education historically, at the secondary, post-secondary and adult levels, has had to meet a more rigorous social, political and economic test than comprehensive or liberal arts education. Both types of education have been expected to serve multiple goals -- some of them economic and labor market oriented, but many of them oriented to the socialization process. Vocational-technical education, sometimes to its benefit and sometimes to its detriment in policy debates over its overall effectiveness, has generally been held to a more stringent market effectiveness test than has comprehensive or liberal arts education. To some extent this is justified; the average cost of educating a vocational-technical student generally exceeds that of educating a comprehensive secondary school student (or at the post-secondary level, a liberal arts student). These higher costs must be justified in terms of a higher economic or non-economic return. It is likely that all types of public secondary and post-secondary education have similar impacts on the socialization of students. Also, given the range of talents and preferences among the educable population, the range of educational choices provided likely satisfy the goal of providing a broad, democratically based access to that type and level of education that suits each young citizen best. Therefore, logic compels one to look for justification in the higher cost of vocational-technical education mainly in the form of higher labor market earnings over a person's lifetime -- whoever that person is, and whatever that person's choice of vocational-technical training.

This fact then imposes obligations and constraints on legislators and vocational-technical education planners and administrators that differ qualitatively from the obligations on those who plan and execute comprehensive and liberal arts education. Vocational-technical education planners and administrators must look more to the current and changing needs of the labor market and industry and must do so in a very specific sense: detailed knowledge is required of the relative demand for occupational skills that will be needed by the local, state, and national economy. Modern, industry-relevant curricula must be then designed and properly executed. This is difficult. The whole system must then be continually updated. As a result, the management information needs, even as the problem is attacked at a general level, are much greater and represent a more continuous demand on management and planning resources than for comprehensive and liberal arts education. However, these activities are not beyond the resource and skill levels of educators and planners.

This technical report addresses the above planning and management issues. The planning data available are presented and critiqued. The framework of the financial allocation and educational planning process is also critiqued in this paper. The broad program goal and its nine sub-goals of this study can be expressed as three major tasks:

1. To compare the existing allocation of funds across vocational-technical programs at the secondary and post-secondary level and judge if the distribution is optimal in a labor market efficiency sense: (See Author note 1.)
    a. Are the appropriate skills for training being identified;
    b. Are the appropriate number of individuals being trained consistent with total labor market demand and other sources of supply in Missouri; and,

    Is the allocation of funds among these occupations optimal in the sense that benefits equal or exceed costs for each occupational speciality?
2. Corollary to the above, to the extent that the distribution may not be optimal, determine the reason(s) why; in particular, investigate whether they are administrative or legislative in origin. Following this step, indicate the nature and extent of the correction required, including any possible funding formula change.
3. Estimate and support with the underlying empirical assumptions, the allocation of funds by five-year intervals 1985 and 1990. (As we shall see from the analysis presented below, this task cannot be performed in any valid way given the available data.)

General Approach

Although the list of sub-goals is lengthy, (See Section III) for all practical purposes due to data limitations, the core analysis of this report has two broad components:

1. An analysis of the disbursement of funds based on administrative or statutory allocation formulas; and,
2. A cost-effectiveness analysis (see Author note 2) by type of occupational skill and training institution.

These two components will achieve the following:

1. Analysis of the disbursement of funds based on administrative or statutory allocation formula will:
   a. Relate the formula components and their weights to the factors that determine the structure of occupational demand in general; and,
   b. Relate the actual allocation of funds by school district or other relevant political jurisdiction to the actual level and structure of occupational demand.
2. The cost-effectiveness analysis by occupational skill and institutional source of training will provide prima facie evidence on the relative effectiveness of each of the occupational skills for which training has been provided. This evidence can then be contrasted with the allocation of funds by formula to give further insight into the relative effectiveness of the existing formula allocation procedures.

Disbursement of Funds by Allocative Formula

It is common within all levels of government -- local, state and federal -- to allocate funds for any given activity by an allocative formula. Apart from increased administrative efficiency and a semblance of objectivity, when properly designed, the allocative formula reflects the considered goals and objectives of the governing or legislative body. This governing or legislative body, acting as the agent of the society, reflects the goals and objectives of its citizens. Thus, such formulas and their rationales deserve serious consideration.

Although the discussion above has proceeded in terms of effectiveness or efficiency standards by which to evaluate vocational-technical education, an allocative formula can incorporate both economic efficiency and non-efficiency or equity goals. It is possible that particular efficiency and equity goals may conflict with each other. For instance, goals of social justice may conflict with the goal to maximize the efficiency with which funds are expended. Most importantly, the desire to concentrate training funds in declining economic areas may not be consistent with the relative concentration of skill demand as registered by employer needs. Employment demand may be concentrated in one region of the state while the supply of trainable unemployed workers may be in another region. Not all of the trained workers will move to the region of demand and some waste will likely ensue. In addition, such allocative formulas can result in a wide disbursement of funds. Program funds may then be spread thinly over many areas, target groups and purposes, "with little opportunity to assemble a critical mass of funds to achieve a needed change in any one area."[31]

Other, more technical, problems can exist with these formulas. In particular, the formulas may attempt to satisfy both the relative demand for training (by skill) for students (which then translates into a supply of skilled personnel) and the demand by firms for a given skill mix and quantity and quality of workers by skill. It is easy to see that this can lead to difficulties: students (see Author note 3) may wish to be trained in occupations (supply) for which there is insufficient demand by employers. In such a case, a student's time and resources are wasted to some degree; society's resources are wasted; and employers have unfilled employment demand or must take improperly trained workers. If workers are improperly trained, they will then have to undergo additional training cost and time. Net lifetime earnings of the students will be reduced as a result. Empirically, this result will show up as unemployment, "underemployment" or non-training-related placement after training is completed. Finally, to the general extent that they focus on program inputs rather than outputs as an allocation mechanism, such formulas are inherently inefficient, and, in fact, improperly conceived.

SECTION II - MISSOURI'S FORMULA FOR ALLOCATION OF RESOURCES

The allocative specifications for the disbursement of vocational-technical funds are set forth in Appendix E of the 1984 Missouri State Plan for Vocational Education. There are five components to the general scheme:

1. The basic grant;

2. Program improvement and supportive services;
3. Special programs for the disadvantaged;
4. Consumer and homemaking education; and,
5. Special projects.

However, within this general scheme, the criteria on which funds are allocated are of several main varieties.

Within the "basic grant" funds are dispersed on the basis of:

1. Grants of specific amounts to purchase certain services such as those provided by personnel to combat sex bias. In an allocative sense there is nothing inherently inefficient with this procedure. The authorities have made a social cost-benefit decision to purchase a given amount of a particular service at a given price. Of course, both equity and efficiency outcomes can be the result of such a provision of service.

   Allocations are made on the basis of complex formulas such as those displayed in Exhibit 1.1 and 1.2. An inspection of the elements of the formula in Exhibit 1.1 shows that most of these are related to conditions that will determine the supply of students to the vocational-technical education system. Disadvantaged individuals, the handicapped, school dropouts and displaced homemakers all focus on the types of individuals who will be trained. In addition, one can view these components of the formula as having social equity or income redistributive objectives as well as efficiency objectives. That is, these people are seen as more deserving and if they can be helped to earn more, both they and society will benefit economically and socially. However, given limited enrollment slots, the equity principle may be violated to some degree, for the implication for administrators is that a selection process must be undertaken: Those eligible individuals best able to benefit from the available training will invariably have a greater probability of access. Thus, equity and efficiency goals are adjusted vis-a-vis each other by this selection process. A cautious manager will attempt to install some kind of selection procedure to maximize the desired measure of program success.

The focus on the additional factors of the LEA county or multi-county unemployment rate and the location (or not) of the LEA in an economically depressed area represents a supply-side focus also. Thus, the allocation formula shown in Exhibit 1.1 in general does not speak to the employer demand side to any significant degree. The possibility is thus established at the outset that funds will be geographically malallocated as well as malallocated among occupations that the market demands.

A correction to any regional malallocation can obviously occur after individuals are trained. They can move to where

Exhibit 1.1

State of Missouri Financial Allocation Formula for Reimbursement of Education Programs for Displaced Homemakers and Other Special Groups, Support Services for Women, and Day Care Services

Programs will be funded on a project basis. Each project will be considered for funding up to 100 percent of documented costs. When distributing federal funds in support of approved projects, the following factors will be used to determine the percent of reimbursement for total project costs.

	Percentage Points Awarded	
1. LEA Y_1 factor value (Federal Vocational Formula) on a scale as follows:		

LEA Y_1 Values	Percent Awarded
- .0	11%
+ .0	12%
+ .1	13%
+ .2	14%
+ .3	15%
+ .4	16%
+ .5	17%
+ .6	18%
+ .7	19%
+ .8	20%
+ .9	21%
+ 1.0	22%

	Percentage Points Awarded	
1. (LEA Y_1 factor value, scale above)	11%-22%	___
2. LEA Y_3 factor value (Federal Vocational Formula on a scale identical to 1. above.	11%-22%	___
3. Program new to the LEA service area Bonus Points - New Program 10% - Expanding Program 8% - Ongoing Program 7%	10%	___
4. LEA county or multi-county unemployment, state mean or above - 4.5 = 5%; 3 = 4%; 2 = 3%; 1 = 2%	5%	___
5. LEA located in economically depressed area	5%	___
6. LEA dropout rates - (a) state mean or greater - 10% (b) below the state mean - 5%	10%	___

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Exhibit 1.1
(cont'd.)

7. LEA percent of disadvantaged/handicapped population. Percentage rate
   (a) state mean or greater - 8%
   (b) below the state mean - 5% 8% ___

8. LEA existence of adult/post-secondary open entry-open exit instruction in the service area 10% ___

9. LEA educational justification to include number of clients to be served
   (a) 100-300 - 4%
   (b) 301-up - 4%
   Values scaled up to 8% 8% ___

10. County dissolution of marriage to include
    - Rank number of county dissolutions in top 20 counties, or
    - Rate of county dissolutions above 5%
    Values scaled up to 10% 10% ___

Source: State and/or Federal Reimbursement for Vocational Education Programs. Author unstated. Undated.

the jobs are. Younger, unattached individuals find this relatively easy to do. The economic and non-economic costs of moving for such individuals are relatively low; however, such may not be the case for displaced homemakers with one or more small children -- a key target group in the formulas. For instance, if day care costs are a factor, nearby friends and relatives provide a low cost and secure option. Movement from the area reduces such options and raises costs. Given labor market discrimination based on sex that lowers wages further, this day care cost factor can be a major impediment to mobility for women in general and displaced homemakers in particular.

3. Within the "Regular Programs" component of the set of "Vocational Education Programs" the state reimburses localities on a fixed percentage basis for such cost components as secondary and post-secondary and adult salaries. This is a significant fact since salaries are the dominant share of educational costs. _If_ one assumes that the localities have made decisions to educate that have efficient labor market outcomes (including efficient and effective design and delivery of curriculums), then there is nothing wrong with providing a proportional subsidy to that activity. However, to the extent that localities malallocate resources, then the state simply ratifies that malallocation. In addition, by simply providing a fixed proportional subsidy, the state foregoes the opportunity to influence the allocative decisions made at the local level. Finally, of

course, the state is subsidizing on the basis of educational input measures and not a measure of efficiency or effectiveness so one just cannot say, a priority, whether the funds are being allocated effectively or not.

Reimbursement or subsidies for other educational inputs are similar and bear the same criticism: Instructional equipment; travel; ancillary services and vocational education administration.

4. Finally, selected activities are funded on a sliding proportional scale that represents the state's estimate of the worth of that activity (presumably, including its effectiveness) to achieving the overall goal of providing an effective vocational program in the state. "Innovative and exemplary projects" as well as "research" are examples of such activities.

In summary, the state allocates vocational education subsidies to localities either on the basis of equity criteria which, by their very nature, say nothing about program effectiveness, or, in general, on the basis of inputs purchased to deliver program services, which also can say nothing about the ultimate effectiveness of the programs. This is not all that unreasonable from the practical, pragmatic standpoint of having to provide state support (from a stronger, more productive tax base) to localities that are pursuing state sanctioned goals (but have a weaker, less productive tax base).

However, as we have alluded to above and will discuss further below, it is, to use the commonly employed term, "unfair" to allocate funds to programs on non-efficiency grounds or on efficiency grounds that are very flawed (e.g., subsidizing program inputs), and then hold the program's feet to the fire on efficiency grounds alone. To say the least, this provides a basis whereby the public debate over the relative value of competing programs can never be properly joined. Or, to use a term coined by Daniel Moynihan in a different context, the stage of the public debate is set for "maximum feasible misunderstanding."

Federal Allocation Formulas for Reimbursing the State

The federal allocation formulas are shown in Exhibit 1.2. In panels A and B, the first three elements in the formulas are ability-to-pay criteria. The same is true of the first two elements in panel C. The last element in each panel is a measure of economic need and, in an indirect sense, and index of potential benefit. However, in no sense do any of these elements relate to the potential demand by employers of the supply of potential skills that will be created by the expenditure of these reimbursed funds. At best, therefore, these formulas are non-committal on the point of meeting employer demand or the employment interests of students. Any statement beyond this is simply speculative. Of course, we do not mean to say that allocation of funds on the basis of ability to pay or perceived need is a wrong or improper criterion for a government to

Exhibit 1.2

Summary of Factors Included in Federal Vocational Allocation Formulas

A. There are four factors included for the secondary formula as follows:

$$Y_1 = \frac{\text{District Levy x District Valuation}}{\text{District Average Daily Attendance (ADA), K-12}}$$

$$Y_2 = \frac{\text{State Average Family Income}}{\text{County Average Family Income}} \quad \text{X} \quad .9$$

$$Y_3 = \frac{\text{District Number of Students-Aid to Families of Dependent Children (AFDC)}}{\text{District Enrollment, Grades K-12}}$$

$$Y_4 = \frac{\text{County Average Unemployment}}{\text{State Average Unemployment}} \quad \text{X} \quad .9$$

B. There are four factors in the formula to distribute funds to junior colleges as follow:

$$Y_1 = \frac{\text{District Levy x District Valuation}}{\text{Institutional Full-Time Equivalency of Students}}$$

$$Y_2 = \frac{\text{State Average Family Income}}{\text{Mean of County Average Family Income}} \quad \text{X} \quad .9$$

$$Y_3 = \frac{\text{Mean of Percent of County Households Under \$3,000}}{\text{Average Percent of State Households Under \$3,000}}$$

$$Y_4 = \frac{\text{Mean of County Average Unemployment Rate}}{\text{State Average Unemployment Rate}} \quad \text{X} \quad .9$$

C. Three factors will be utilized in the formula to distribute funds to senior colleges or universities as follow:

$$Y_1 = \frac{\text{Institution's State Appropriation}}{\text{Institution's Full-Time Equivalency of Students}}$$

$$Y_2 = \frac{\text{Mean of Percent of County Households Under \$3,000}}{\text{Average Percent of State Households Under \$3,000}}$$

$$Y_3 = \frac{\text{Mean of County Percent Average Unemployment Rate}}{\text{State Average Unemployment Rate}} \quad \text{X} \quad .9$$

Source: See Exhibit 1.1

adopt. We only suggest that one cannot presume that the result in terms of the training or educational outcome will necessarily be economically efficient in the sense that the skills employers need will be provided through this device. And, of course, as we noted in the closing critique on the state reimbursement formula, it is clearly incorrect to critique in efficiency terms programs whose funds have been awarded on a non-efficiency basis.

Ex-Post Critique of Financial Allocation Based on Cost-Effectiveness (Placement) Ratios

Tables 25 through 30 indicate the type of "cost-effectiveness" analysis based on placement data. There are both strengths and weaknesses to this method of analysis.

Strengths: The main strength of this approach is that it summarizes the initial labor market outcome of the vocational-technical education process -- placement in a job. The degree to which both supply (students trained) and demand factors (skills required by employers) are satisfied are jointly reflected in such a measure. However, the separate contribution of the educational process to these supply and demand factors cannot be identified. As noted, they are jointly determined. Finally, this measure also reflects management efficiency as well as the efficiency of program design.

Weaknesses: The major weaknesses of this measurement approach are two. Neither weakness can be avoided when using placement ratios alone.

First, in the present study placement ratios are the only measure of outcome. This is due to data limitations. The correct measure would be a cost-benefit ratio in which the numerator would be lifetime discounted (before-tax) earnings due to training in a given occupational skill and the denominator would be the discounted social costs of that training (see Author note 4). However, the placement ratio is widely accepted by policy makers and administrators and does apply prima facie evidence of program effectiveness. Any program that fails the effectiveness test based on this simple measure should be discontinued or significantly revised, since, if there is a low placement ratio, it is difficult to believe that earnings will be high relative to costs.

Second, and just as important, this measure reflects only the gross outcomes of the particular vocational-technical training and not the net outcome due only to the training and not intermingled with outcome effects that are due to particular characteristics of the students such as their previous background, their intelligence, their motivation or such things as sexual or ethnic factors that are reflected in labor market outcomes. However, since the cost of measuring such net outcomes is very high, both in terms of time and resources -- in fact it has never been adequately done for specific occupational skills, we have no alternative but to use the data as they are currently collected. These placement ratios, however, can be misleading and an assessment of the efficiency of Missouri's financial allocation based on these data is subject to error -- possibly severe error (see Author note 5).

Outcomes for Secondary and Post-Secondary Vocational-Technical Education

Tables 25 and 26 display placement ratios by relatively broad skill category. Note that we wish for purposes of argument to apply a very strict test to the structure of courses offered so the focus is on the "Employment (Training) Related Placement Ratio" even though we recognize that many individuals attending vocational training may intend to proceed to further education. Acquiring such further education is also a positive outcome. On the other hand, it can be reasonably argued that there are cheaper ways to prepare for advanced education than to study the relatively more expensive vocational curricula; therefore, to the extent that the vocational curricula are inefficiently used by students (possibly due to poor guidance counseling) as a preparation for further training, this represents an unnecessary cost to the educational system and society, and, possibly, the student.

The most significant fact about the placement ratios in Table 25 is that only four of the 60 or so occupations have ratios that equal or exceed 50 percent! Only nine equal or exceed 40 percent! For the group of courses as a whole, we have positive knowledge that at least half do something productive other than work initially in a training-related occupation. It is difficult to evaluate the true productive significance of this, however. General education may have achieved the same result (see Author note 6).

Therefore, since these are gross program outcome data, they suggest a relatively weak performance on the average if training-related placement is the measure of effectiveness, since the net program effect on placement is almost certainly smaller. Indeed, it is troubling to note that econometric and statistical analyses of the labor market outcomes of secondary vocational education versus the comprehensive curriculum shows no net earnings gain to secondary vocational education[32] (see Author note 7). This is a very troublesome finding in light of the higher average cost of vocational education. It has not been determined why there is no net earnings gain in these studies, however. It could be due to a number of factors, such as:

1. Improper structure of skills vis-a-vis labor market needs -- a prime suspect given the low employment related placement ratios;
2. Poorly designed curriculum and teaching methods, including out-of-date equipment and failure to use cooperative arrangements more effectively; or,
3. Poor quality students or allowing good students to make the wrong choices.

The performance for post-secondary education is somewhat better. The overall employment related placement ratio exceeds 40 percent. It exceeds 60 percent for agricultural skills but is below 40 percent for business and office skills and technical specialities. "All

Other Productive Activity" -- further schooling or non-training-related employment -- represents only 23.7 percent of the total sample; but this measure is likely biased downward since there is a 30.1 percent non-response rate.

Next, we note from Table 27 that the performance of adult vocational graduates is superior to that of the previous two groups of graduates in terms of training-related placement. About 77 percent of the adults trained in health occupations found training-related jobs -- more than triple the placement rate for secondary students and 50 percent higher than that of post-secondary students. This relative performance is similar across all broad occupational groupings, although it is necessary to point out that the mix of occupations among each of the three levels of education varies for each occupational group. Finally, we should note that cost-benefit studies of adult government sponsored training, to which adult vocational education is directly related, generally show positive labor market outcomes.[33]

Comparison of Relative Placements with Relative Expenditures

Tables 28 and 29 contrast the relative numbers of training-related placements with the relative amounts of total (local, state and federal) resources spent on each broad skill category. The results, in some cases are quite striking. As shown in Table 27 Distributive Education absorbs only 6.4 percent of the total funding while accounting for 27.2 percent of all training-related placements! Home Economics absorbs 27.0 percent of total funds while accounting for only 3.6 percent of total training-related placement (see Author note 8). Of course, to the extent that the efficiency of household production is increased by such training, this measure understates the true contribution of Home Economics training. Trade and Industry absorbs 35 percent of the funding, accounts for 31 percent of training-related placement but also contributed 37 percent of the total unemployment, which will reduce severely the net earnings gains to these skills.

Post-secondary vocational education tells a related story. Business and Office occupations absorb about 20 percent of the funds but contribute 32 percent of the training-related placement. Trade and Industry absorbs 35 percent of the funds but contributes only 24 percent of the training-related placement.

In short, even these crude data, which are admittedly conceptually weak, are dramatic enough to suggest that state and federal funds may be seriously malallocated within vocational education in the State of Missouri. Because the allocation formulas focus on the supply side and not the demand side as dictated by employers' needs, we note that these formulas contribute in some degree to this malallocation. However, we do not, and cannot with the available data, measure how much and exactly why this malallocation occurs.

Comparison of Production (Supply) with Estimated Demand

There is one final and admittedly imperfect set of data that can be used to gain a glimpse of the relative effectiveness of vocational-technical planning decisions in the State of Missouri -- comparing the estimates of individuals trained from all major sources of supply -- public and proprietary -- to the rough estimates of labor market demand. (The estimates of labor market demand are very imperfect. Problems with these data are discussed by Patricia Flynn in her treatment of Goal I and will not be repeated here.) The analysis here is only suggestive but some of the information is indicative of possible serious malallocation of state and local resources. Table 30 contains several types of information:

- Average annual openings -- net demand
- Total supply -- completions
- Total demand minus total supply
- The percent of shortage or surplus
- Occupations in which over 50 percent of completions are proprietary - designated by an "@" in the total supply column. On the assumption that proprietary schools are profit maximizers and will not train for those occupations in which there is no demand, this is a test of the market relevance of the quantity trained.
- Occupations in which there is no proprietary training being performed - indicated by an "*". Again, we assume that this is an index of the proprietary sector's judgement of its ability to place the individuals so trained in a given skill.

Given the admitted problems with these data, some striking, if only suggestive phenomena are displayed. For instance, proprietary schools do not provide training in Agriculture Mechanics and the public schools oversupply individuals to this occupation by a factor of 6.5 (646.0 percent). About 2,305 individuals are trained while net demand in FY 1984 was estimated at 309 workers. In general, however, in those occupations in which there is no proprietary supply, the public schools oversupply by less than 100 percent. Given the problems with these data, it is possible that this does not represent a serious problem in malallocation.

Next, neither the public nor the proprietary sector does much training in Insurance Marketing. There is an undersupply of about 100 percent. This points out a problem with such data, since there does not seem to be a shortage of insurance salespersons in the economy. It is likely that private sector firms themselves dominate the training in this occupation. Therefore, the above index is misleading. It is possible that neither the public nor the proprietary schools should train in this occupation.

Finally, in those occupations in which over 50 percent of the supply is from proprietary schools, there are three dramatic examples of surplus: Industrial Technology, Cosmetology and Real Estate Marketing. However, in general, the surplus or shortage does not exceed 100 percent.

In summary, if these data were strictly reliable, they would indicate significant problems of resource malallocation in vocational-technical training. Since they are not reliable, they serve to initiate debate but likely raise more questions than they answer. These data are presented and discussed, however, because it is such data on which the overall debate is based.

A Suggested Method for Rewarding Demand-Side Performance

As noted above, the allocative formulas above essentially ignore the employer demand-side of the market in the distribution of subsidies to educational institutions in the state. It is possible to partially correct for this omission and provide a formula to award at least some of the funds to each education institution or jurisdiction on the basis of labor market performance. This could be done by including rewards for placement performance in the allocative formula.

Although the final characteristics of such a procedure would have to be worked out in pragmatic legislative and administrative give and take, the allocative device would have the following characteristics:

1. There could be a rebate to the educational institution or jurisdiction on the cost of any occupational skill that has a placement rate equal to or over X percent.
2. The rebate is paid ex post, as a function of placement performance in the previous academic year.
3. The rebate is symmetrical. That is, support can be withdrawn for a poor placement performance as well as a good one. There would likely have to be a "hold-harmless" level below

which support would not be withdrawn in any given year, but with the possibility over, say, a three-year period, that support could be totally withdrawn.

4. The placement rate would be measured by school and occupation, statewide, each year, "Y" days after graduation.
5. The rebate is in force for only one year; that is, performance must be re-measured each year. But funds awarded in one year can be carried forward one or two years to reduce inefficient incentives to spend.
6. The rebate can have a sliding scale.
7. The rebate level and sliding scale can vary by occupation and between secondary, post-secondary and adult education.

Certain issues will have to be decided administratively or politically:

1. The nature of the rebate level and sliding scale;
2. The payment structure for the sliding scale;
3. Activities that are allowable expenditures for rebate purposes; and,
4. The date after the course end on which to sample for placement performance.

To be valid, the measures of placement must:

1. Be based on appropriate statistical sampling procedures. Sample sizes (not proportions) are critical. Non-response bias is a serious potential problem;

2. Be specific by skill or occupation and school location. Note that such data are already being collected;
3. Have a provision for quality control in the administration and coding of the mail questionnaire. A procedural manual will have to be written, adhered to, trained for and enforced statewide;
4. Be based on all graduates and dropouts in an occupational skill that have not gone on to additional education. For practical measurement purposes, all job placement will have to be counted, not just employment-related placement; and,
5. Be based on each separate target group. Different target groups cannot be directly compared.

Additional Problems

There is first the problem of what to do about the perverse effects of the business cycle. One possibility is to compare the placement rate by occupation against the average placement rate for that occupation across the state as a whole.

Finally, there is the problem that this reward/punishment approach presupposes an equally healthy labor market base among labor market areas equally statewide. This will clearly not be the case. In fact, areas in the state have unequal economic bases and resources. Indeed, poorer areas may have poorer labor market conditions and be penalized for this factor rather than poor planning and administration. These are not insurmountable problems, but they must be dealt with.

In summary, it is feasible to include criteria to reward educational institutions and jurisdictions based on an index of labor market performance. Costs are involved, but costs, mostly unmeasured though apparent exist in the present system.

SECTION III - QUESTIONS AND RESPONSES

1. What are the current funding sources and dollar amounts available from DESE, LEA's and others to support vocational and technical education programs? What are the funding formulas?

The 1984 and the 1983-87 Missouri State Plans for Vocational Education detail elaborately the funding sources and dollar amounts available to support vocational and technical education programs. Those numbers do not require repetition here. The funding formulas are also detailed in these two documents in Appendix E of each document.

2. What are the perceived strengths and weaknesses of Missouri's present financial distribution system for vocational education?

Strengths: The state and federal formulas are designed to allocate funds mainly to target groups or areas that are suffering economic hardship. This can have two effects:

(1) Equity: The disadvantage and lower income persons have greater access to vocational-technical education; and

(2) Efficiency: To the extent that this education raises the human capital of these target groups, economic efficiency is increased for the economy. This benefits taxpayers as well as the recipients of the educational services and subsidies.

Weaknesses: The weaknesses of the allocation formulas are severe. Fundamentally, they ignore the structure of occupational demand that should be the core of any allocation formula that is designed to raise a trainee's lifetime earnings. None of the three main formulas relates to the labor market outcomes of the training process. Instead, they are needs based, focussing on supply independent of demand. **It should be pointed out that this is most** likely the main intent of the formulas. However, the key question asked of this study is an efficiency or effectiveness question and not one of fairness or equity of the formulas. Fairness or equity judgments simply require a matching of those who received funds and the amount of funds they receive with legislative intent. Efficiency or effectiveness questions are not pertinent here.

This criticism is mitigated somewhat by the fact that courses offered to respond to labor market demand are intended to reflect employer's needs as expressed by that demand. But no reliable cost-benefit assessment exists to check out the reasonableness of the allocation of funds and the structure of courses and their relative enrollments. This problem is not peculiar to Missouri. However, with some extra effort and a reallocation of management and management information systems data, a first cut at a cost-benefit or cost-effectiveness assessment can be made. This should be done if there is a desire to improve the effectiveness of vocational-technical education.

In the meantime, to quote Odden:

> "Thus we have no data enabling us to compare effective schooling in high-, average-, and low-spending school districts. Nor has there been any systematic attempt to find out how schools identified as exemplary differ from other schools in similar settings in the ways in which they allocate and use their resources."[34]

3. How does Missouri's financial distribution system for vocational and technical education compare with the systems in states having similar characteristics?

In broadest terms, these funding formulas are similar in that they tend to focus on target groups and the supply side of the market rather than the demand side. The fact that among the states they may not exactly correspond in terms of the target groups or regions they focus on is of much less significance than the fact that considerations of the supply side (the students) rather than the considerations of the demand side (employers' needs) drive these formulas.

4. What are the most critical funding elements to be considered in evaluating a vocational and technical education program?

The most critical element should be the incorporation in the funding formula of program performance measures -- at least a training-related placement measure. One way to do this is to provide for an increase (decrease) of funds to any skill area that has a training-related placement rate above (below) a given rate. This variable can be added to the existing formulas and assigned whatever weight the state legislature considers appropriate.

This being achieved, one could then direct one's focus to the ideal structure of target groups to be considered.

5. To what extent are fiscal resources for vocational and technical education programs in Missouri being allocated in accord with labor market demands? This cost-benefit question requires a judgement on relative costs and benefits by funding area or skill.

The litmus test of a vocational-technical program is determined by whether, on net, its benefits exceed its costs. These types of cost-benefit measures are not now estimated.

While it is true that the managers of the vocational-technical programs: a) make an effort to design courses for those occupations in greatest labor market demand; and b) attempt a serious effort at job placement, the fact that the training-related placements reported in Tables 25 and 26 seldom exceed 50 percent and average only about 30 percent at the secondary level suggests that program managers may require improvement in performance of any or all of the following:

a. Identifying shortage occupations and the extent of demand;
b. Developing appropriate curricula;
c. Developing appropriate training delivery systems; and,
d. Influencing students to properly choose among alternative courses.

A cost-benefit test -- a test of program outcomes -- will force managers to pay attention to these factors. In contrast, a focus on performance measures that are essentially program inputs -- the type of target groups enrolled and their numbers, for instance, is not a fundamental test of whether program finances are being properly allocated in a market effectiveness sense. Any target group deemed deserving will then more likely be taught in skills for which there is a labor market demand.

6. To what extent can a funding pattern bring about changes in Missouri's vocational and technical education delivery system, e.g., improved program quality, increasingly responsive to labor market need? How can this funding pattern be achieved?

As the discussion above has indicated, add a true cost-benefit test to the measure of program outcomes and key the funding allocations to that test.

7. What barriers to change in the vocational and technical education delivery system in Missouri exist as a result of current funding mechanisms?

There are two types of barriers: Political and economic. The political barriers appear to be more formidable.

Political: A simple inspection of the components of the formulas suffices to demonstrate that they are focussed on particular target groups and geographic areas with relatively greater economic problems. This, in itself, is not unreasonable. However, it ignores the demand side of the labor market -- employer's needs. In any case, these are the target groups who are identified as being in relative greater need. To that extent it will be difficult to change the components of the formulas or their weights.

Economic: Any reasonable effort to change the formulas ought to involve the injection of labor market outcomes as the major criterion for allocating funds to programs and areas. This will require changes in the state educational MIS system. As the body of this study demonstrates, labor market follow-up data are already collected, but these are deficient. Wage rates, hours worked and employment duration are not measured. Thus, a revamping of the MIS system is required to develop data on training outcomes. These data on outcomes must then become at least part of the prime components in determining the allocation of funds.

8. What alternate mechanisms for financial distribution would facilitate desired change in Missouri's delivery system for vocational and technical education? What is required to achieve these alternative mechanisms?

As noted above, a cost-benefit test, by broad skill category at the minimum, e.g., agricultural; horticultural; distributive education.

A broad based change in the educational MIS system is required and a simple cost-benefit algorithm should be put into an automated framework.

9. What are the potential gains and losses associated with changes in the financial distribution system for vocational and technical education in Missouri?

The potential gains are an increase in the efficiency with which vocational-technical education funds are allocated -- labor market earnings of graduates would likely be made to increase. There could be a loss in equity benefits to disadvantaged groups or regions, but not necessarily so. The improved cost-benefit information could change (in all likelihood) the structure of courses offered, their curricula and their relative geographic location. For deserving members of the target groups to get certain types of training, they might have to relocate or commute long distances. Subsidies might be required to pay for relocation or commuting. If the subsidies can't be had from reallocation within the budget, taxes would have to be raised.

FINANCING VOCATIONAL EDUCATION IN MISSOURI

Introduction

This paper is an initial step to discuss the general picture of the financial support of the public education in Missouri, to understand the context in which vocational education operates, and to identify the fiscal parameters that appear to be shaping the nature of vocational education in Missouri. This paper is based on these premises:

(1) Vocational education in Missouri appears to be very similar to that in several other states. A few states have leaped ahead of others in some high technologies largely in colleges and universities.

(2) Vocational education in the secondary schools is facing an increasing struggle

  (a) to provide a unique training for youth who enter work upon graduation from high school,

  (b) to meet the emerging demand for some adults continuing education at the secondary level, and

  (c) to provide a strong foundation for extended training at the post-secondary level.

(3) The total field of education appears to be in a state of readiness for change--for the opportunity to respond to leadership from the political, business, and educational communities.

(4) The next few years can be a stage of transition--of reorganizing, restructuring, extending, and enriching to something that can be distinctive and unique among the states of this nation.

(5) The present formulas for financing the needed transition in vocational education at the secondary level are inappropriate and inadequate.

(6) During the next few years, vocational education should be planned in incremental steps through this transition period. During this time a budget approval procedure for full-state funding should be established for new programs and for the additional costs of revised programs.

(7) Toward the end of the transitional period when characteristics of programs, instructional units, supportive services, and equipment become more clearly defined, the present funding procedures can be supplanted by more functional ones.

The Changing Face of Education

Perhaps the paramount challenge of educational leaders is to identify and interpret the occupational and other cultural trends sufficiently in advance of employment demand to plan changes in the educational opportunities of all age groups and skill levels. Some of the trends, as the Goal 1 Committee has found, develop slowly and ambiguously for a time before bursting out in particular directions. Computerization is a good example. Mankind has had computers for thousands of years: notches on a tree or other objects, the abacus, multiplication tables, logarithms, slide rule, and mechanical calculators with gear trains. Suddenly within recent years the transistor, the integrated curcuit, and micro-processing systems have opened a new era for communications, robotics, word processing, and computerization in many forms.

Some futurists have written interesting fantasies that have alerted us in a general way to a number of trends, such as: H. G. Wells in the 1930's, and more recently Eric Hoffa, Alvin Toffler, John Naisbitt, and Christopher Evans. But even they depended heavily on what already existed and peeped only a short distance into the future in very general terms, but with magnificant rhetoric.

The implications of growth and application in all forms of knowledge lead to questions of adaptability in business and various areas of government, including education in particular. Educators have been criticized by some persons as slow to adapt to the changes that affect the employability of individuals at a given moment. They are severely criticized when an imbalance occurs between the supply of trained workers and the demand of employers. But educators cannot act unilaterally. They are agents of Boards of Education, the DESE, the Legislature, and the citizens at large. They need cooperative support and the requisite financing to modify the old and to add the new.

For example, farriery was an important and stable form of employment in Missouri for many years. The state was renowned for its production of the best mules in the nation, as Tennessee was famous for its horses. Consequently, there was a strong demand for farriers in all regions of the state. What happened to the farriers as the source of farm power shifted from the animal to the combustion engine? Some became motor mechanics. Others joined special veterinary clinics and racing companies.

Take another example, an old one involving large numbers of skilled employees in production and repairing of timepieces (clocks and watches). From 1500 to around 1800 A.D. the industry was comprised of small producers, highly skilled, with a few apprentices who learned the trade and in turn established themselves in business to employ other apprentices. Mass production emerged in the early part of the nineteenth century and reached full swing by 1900. After World War II the Federal Government provided financial aid to selected schools to train repairmen (and women) for the anticipated employment demand, following the outburst of popularity of the waterproof, self-winding wrist watch. Around 1950, there were over 80,000 well qualified horological repairmen in the United States.

The electronic revolution occurred in the 1960's with the transistor, the quartz chip, and the integrated circuit. By 1983, the number of repairmen was reported down to about 12,000, at a time when the sales of watches had shifted to about one-fourth mechanicals and three-fourths electronics. The latter require less than one-half the time for repair than the former. Furthermore, the return of the "dollar watch" concept for pitching instead of repairing may soon dominate the low-priced market.

The prospects for youth to enter this field appear very limited as compared with past years. Yet, there is a bright side which may appear as well in many other areas of high skills. These training programs have become step one for the second stage of technology involving designing, producing, and repairing a variety of advanced mechanical and electronic devices. So, while the options of beginners have narrowed for one line of products, other lines have opened for expanded opportunities with some additional training in electronics. These examples are types of changes which are occurring in vocational education.

The entry level skills of high school graduates are no longer adequate as supply measures to meet most market demands for workers. A better test of these graduates would be their progress after three to five years with part-time supplemental training in community colleges and other institutions. The evaluation of vocational programs must include the entry skills and knowledge of those who enter college as well.

A person only has to examine the programs in agriculture and allied fields in a university to understand the value of vocational education in high school for those who continue to study agriculture in college. At the post-secondary level, career options become distinctive and specialized, including such as advanced training for farming, professional farm management, agricultural engineering, teacher of agriculture, researcher in agronomy and plant genetics, agriculture economist, veterinarian, and others. The fundamental elements of this example can be found in other programs such as business, manufacturing and industrial processing, home economics, electronics and other micro-precision technologies, and selected services.

Education is facing a period of transition with much opportunity and challenge. There will be much revising, trimming, expanding, and adapting the curriculum to serve all ages of our citizens--youth and adults. Programs will be modified within the boundaries of redefined goals. When goals are clearly defined, programs can be developed with clarity. Under these conditions the costs and savings of innovations can be estimated with reasonable accuracy.

There is a big gap between the setting of general goals and the working out of effective instructional learning processes at the classroom level. As activity on both proceeds an interaction between the two should improve the clarification of each. For example, developments in computer science and telecommunications may soon have revolutionary effect on the content and organization of the total school curriculum and instructional methods (called "delivery systems"). In a very few years, the electronic devices may provide the means for a gifted instructor to teach some courses in a program to students in several high schools, and do it more effectively with better learning results than in the present systems. If this can be done and still maintain good "hands on" learning experience in courses like physics, chemistry, and vocational subjects, there will be a revolution in education beyond present comprehension.

It is a well-known fact that social and economic "revolutions" occur when the price of the medium is within reach of the masses. The revolution in farming did not occur until something better than the Fordson tractor with metal-cleated wheels was produced to replace animal power. The old gramophone was another example, and so were the first radios with multiple dials to be adjusted before anything intelligible came through. Who paid for the transition from these early, costly inefficient gadgets to mass produced, cost efficient models? The venture buyers, of course.

These analogies may be highly applicable to some parts of the educational systems today. Education may have reached its peak as a labor-intensive operation. Improvements in the future may come with such scientific developments as two-way television hook-ups between schools, and with computer banks of information available to every student with a computer and video system. Vocational education may be one of the most feasible parts of the secondary school curriculum for a state to spend "venture" money on carefully planned innovations of this type.

The teachers (all professional personnel) of educational institutions are the principal components in any equation of change. Despite any criticism to the contrary, they represent a great professional wealth to the state of Missouri. They have an untested capacity for improvement in the teaching-learning process. They need only incentives and means to change the conditions over which they have control. They need the cooperation and assistance of all citizens in position to change those conditions over which they (the teachers) have little or no control.

It is time for Missouri, as well as other states, to finance a plan whereby teachers can begin systematically to learn how to use computers and other electronic devices to enrich the educational programs. Otherwise, they may have difficulty staying ahead of the next generation of students. The "gramophone stage" of these devices very likely will pass within a short time and universal use will be available at low cost. Subjects like typing, budgeting and accounting can be stored in cassettes and taught to two or three times as many students as at present with equal or better results. Take the example one step further. Home computers soon will be priced within the reach of most families. Students will be able to purchase cassettes for some learning skills and carry the record of their progress to school for monitoring. The implications for such changes to free the time of teachers in some areas and to modify their roles are obvious. The schedule of the school day and the character of student homework may be changed markedly. The present speculation about increasing the length of the school day may become feasible only for those whose homes will not provide conditions that are conducive to some learning--learning that can enrich and extend the time spent in school.

The community colleges and other institutions of higher education have primary leadership responsibility in educational change. They have research, a high degree of specialization for educating workers in all occupations, including education. All of this has an impact on all of the educational institutions from nursery school through the university. The rising need for more adult continuing education at all levels is adding a new dimension to the total cost of education in America. The total mix of the social investment in education will require a much greater sophistication of cost-benefit analysis in the future than exists at present. Such analysis in conjunction with planning and articulation of programs between secondary and post-secondary levels will be essential to maximizing economies and educational achievements.

Public Elementary and Secondary Schools Finance

To fix a base of reference, let us start with total current operating expenditures of $1,785,535,599 for the year 1982-83. There were 718,170 pupils in average daily attendance, and a state average expenditure of $2,486 per ADA. Of this total, the revenues were obtained from three levels of government as follows: federal 5.7 percent; state 43.9 percent; local district 50.4 percent. These figures do not include about $344,150,716 of expenditures for debt service, capital outlay and related expenses for which distributions by level of government are not available.

The reported total of expenditures for vocational education at secondary and post-secondary levels was $116,511,863. Revenue receipts were derived from government levels as follows: federal 11.8 percent; state 20.2 percent; local 68.0 percent.

These aggregate figures immediately raise some questions which will need study. The first one is, why is the state contributing only 20 percent of the expenditure for vocational education, while it provides 43.9 percent for all grades K-12?

A number of speculations arise at this stage. The local districts and other agencies have discretion to fix salaries, modify programs, and otherwise add expenditures beyond the approved categorical funds from state and federal sources. Also, there is the questions of whether the full-time-equivalent number of pupils in vocational programs is deducted from the general state aid claims. If not, the districts receive some state aid for vocational programs through the general aid formula, a general practice in other states. However, vocational programs are more expensive than the average of the academic counterparts. Thus, given the level of the state-supported foundation and the foregoing aggregate data, it seems reasonable to conclude that the burden of improvement and/or expansion of vocational education rests very heavily on the local districts, unless there is a revision in the fiscal pattern to increase markedly the state's contribution.

The local tax base of school districts in Missouri, as in all other states, is narrow and limited as compared with the state which has income and transaction tax bases. There are serious limitations at the state level too, but not comparable to the local district. Furthermore, the premise is that education is a state responsibility. Local taxing power is delegated and controlled, to some extent, by the state government.

In studying the general fiscal picture, it is often helpful to compare a state with others in the same region. Some comparative statistics for Missouri and its four neighboring states relating to state aid are as follows:

	State Aid Per ADA 1982-83	Change 1978-1983
Missouri	$1,186	88.3%
Arkansas	1,237	77.5%
Kansas	1,659	86.8%
Iowa	1,323	58.1%
Illinois	1,427	43.9%

Missouri made the largest percentage increase from 1978 to reach the 1983 level of state support from state funds. Data are not available to show comparative changes in local revenues.

In 1982, Missouri ranked 20th from the bottom on per capita income of $10,175 as compared with the national average of $11,056. The neighboring states compare as follows: Arkansas - $8,332; Kansas - $11,448; Iowa - $10,532; and Illinois - $12,162. This is the best single statistic to indicate a state's ability to support education.

Higher Education

Some comparative statistics on higher education in 1982-83 are as follows:

	Amount per FTE* Student	Support per $1,000 Personal Income	% of Population Enrolled in Higher Ed.
U.S. Average	$3,582	$ 9.50	18.6%
Missouri	2,811	7.10	17.2%
Arkansas	3,740	10.40	20.2%
Kansas	3,463	11.30	18.9%
Iowa	4,331	12.50	19.6%
Illinois	3,050	7.40	17.2%

*Full-time Equivalent

Missouri and Illinois were the lowest in effort (support per $1,000 income) among these five states, also with the lowest percent of population enrolled in higher education. Iowa, which spent the highest per FTE amount per student, also made the highest effort of $12.50 per $1,000 of income. More information is needed about higher education in these states before making any tentative conclusions about the picture at this level. For example, the proportions of enrollments in community colleges, degree-granting institutions, and graduate levels would be important in estimating where types and levels of vocational programs might be most needed and cost effective.

Another critical type of information relates to programs for training teachers with new knowledge and skills. Some will have had no teaching experience, others will come from retraining of present teachers. Such training is an investment, and the most important one that should be paid up front before commitment to programs, equipment, and facilities, and placement of responsibility for operation.

Funding Mechanisms

The planning of new changes in vocational education should include the development of policies for provision of essential revenues and the most appropriate mechanisms for the allocation of funds. Of all principles that are fundamental for success, the most critical are equity, adequacy, simplicity, and certainty.

Four options that appear to be worthy of careful study: (1) The first is simply to provide more funds through present procedures, (2) the second is to provide new funds through new procedures for specifically defined programs and allied services, (3) the third is to overhaul the present total fiscal system for all elementary and secondary education into simpler, more rational, and more flexible procedures to provide gradual adjustments in existing programs and development of new programs that require prompt and decisive action, (4) the fourth is a combination of options 1 and 2 with a four to five year goal to achieve option 3.

Option 1: Present Procedures

The federal vocational formula is intended to focus funds on children, youth, and adults from low income families, impoverished homes, and on communities with high unemployment and high dropout rates of schools. The formula prescribes complicated mathematical treatment of aggregate data on the local community, such as tax ability, total school population, and categories of low-income families. The formula gives more satisfaction to political leaders for political accountability (very important of course) than to precision in the measurement of educational need of the school population for which the school system is responsible in a given fiscal year.

The federal formula has had a strong influence on the state's procedures for distribution of vocational funds. However, the state exercises leeway to go beyond the restrictions imposed in the federal formula, thus adding flexibility, evening out some of the measurement errors, and increasing the degree of adequacy.

The level of last resort for dealing with the problems of vocational financing is the local district. In 1982-83, these units provided 68 percent of the presently identified funds for vocational education. These districts have the final discretion or power to make the residual decisions on budgeting, to do the fine tuning in the allocation of funds to special programs such as vocational education. This power also applies to the operation of special education, science education, and other educational components that may or may not have categorical aids from the state and federal levels of government.

Given this unique system of governance in education, some individuals argue that the role of the federal government is to support those functions and needs in the "national interest". Such argument is often largely political rhetoric and only partial truth. The state and local units are equally concerned with these functions, though the concentrations of them may impose fiscal burdens unevenly among communities and states. A more precise principle is that the whole nation can share in evening out the excess costs of concentrations of educational and other social needs over which states and local communities have no control.

One often hears overtones of "educating our children for improvement of our community." In fact, the great majority of high school graduates spend their adult lives in other communities, but this does not negate the view. Job opportunity for youth has a low correlation with the locale of their early schooling. Thus, a large issue in education to be dealt with is the variation in trade-offs of (1) educational burdens of cost among communities and states, and (2) the distribution of job opportunities. Perhaps two of the most extreme examples are the "silicon valley" in California and the "chip corridor" around Boston. Most of the highly skilled workers in the high-tech industries in these areas were educated in high schools, colleges, and universities in other states. The future growth of these and allied industries may diffuse the present concentration of human talent and job opportunity.

For the past fifty years, the dominant principle in public educational finance has been equity. This concept has been defined in many ways with concern for the student and the taxpayer. Perhaps the second one has been adequacy. One example of this has been the persistent argument of the educational profession to achieve and maintain parity of salaries with other professions that have comparable educational preparation and talent. A third principle, highly dramatized recently, has been educational quality. This one has had a great variety of descriptors: cost efficiency, educational outcomes, cost effectiveness, returns for money spent, and pupil achievement.

Unfortunately, educational research has not developed enough rational, dependable, and convincing measures of educational quality that can be related predictably to fiscal needs. Educators still depend mainly on a few test scores, breadth of program opportunity (probably the best), and a proxy of aggregate expenditure per pupil in ADA.

The last one, widely used for comparative purposes, has some serious defects. In more than a dozen states in the past that among districts spending the same dollar amount per pupil in ADA, the small ones (under 100 pupils in high school) would have as few as 35 course credit hours of program breadth for four years. In districts with 1,500 or more pupils in high school, the programs consisted of 80 or more course credit units.

To touch on a few illustrations of developments with respect to these principles, over the past 50-odd years may be helpful. In the depression of the 1930's, the federal government instituted various programs of job training. Preparation for World War II brought a great expansion in short-term training, ranging from welders for shipbuilding to gunners for fighting. While there was a translation in forms and objectives from peace time to war time, the results demonstrated that training could be done.

During that period and on into the 1950's, many citizens in and out of the educational profession argued for a strong role of the federal government to help equalize the support of an adequate foundation of expenditure for the public elementary and secondary schools among states. The classic example in the late 1930's was that New York state had a taxing capacity at state and local levels to raise $60 for each $1 that could be raised in Mississippi at equivalent burden to taxpayers. By 1950, the difference had narrowed sharply. By 1970, the difference had dropped to about 1.8 to 1.

In the meantime, the issue of the role of the federal government had shifted to relief from concentrations of poverty. The overall proportion of support contributed by the federal government rose only slightly. The state and local tax bases have responded to general educational demands of our nation to increase the level of support for improvement and to offset inflationary effects.

The concept of education as an investment in human capital or talent has become a subject of lively interest among economists as well as educators and political leaders. The emphasis today seems to be centered on educational improvement for general economic and social health. The rapidity of change in the work place in recent years has become startling, leading to many speculations such as multiple career training, alternative programs for the unemployed, abandonment of vocational programs in secondary schools, and others.

For many years, there has been some polarization around two ideas, education and training, with much debate to clarify their nature and the place to provide each. Educators generally have subscribed to the emphasis on education, with training in high school for entry-level work skills upon graduation. Some critics claim that secondary schools have not kept up with changes in business and industry for higher levels of skills as well as for new ones. Perhaps the chief weakness in vocational education in the secondary schools during the last two decades has been insufficient financial support, and in many small communities lack of organization, to offer programs of sufficient breadth. Another problem has been insufficient resources to enrich the academic work of many vocational students. The result has been that the schools have not been able to change the public's image of vocational education as something for the non-college bound students who were destined for low level skilled jobs at best. A few schools, but certainly not enough, have broken through this barrier. They are the ones that have programs which offer good preparation for pre-engineering, pre-veterinary medicine, pre-agriculture, and some other professions.

Much of the current problem in vocational education lies in the general component of the students' programs, particularly in mathematics, science, and linguistic skills. Strong evidence to support this observation is found in the introduction of various forms of remedial instruction in many schools. Further evidence appears in community colleges that have pre-requisites of mathematics, science, and others before students are admitted to technical courses such as electronics, micro-precision technology, medical technology, and others.

A number of questions must be considered:

1. Will the federal government likely make any substantial change in its financial support of vocational education, other than emergency measures for unemployment and related problems?
2. Do the present state funding procedures have the flexibility and capacity to accomplish the dual purpose of enriching existing programs and adding new ones with great impact?
3. What improvements are needed in vocational education for the students who do not attend a community college or other higher educational institution?
4. Can the secondary schools establish performance levels of vocational graduates that would be acceptable for advanced placement in the same areas in community colleges?

Option 2: Funds for Specifically Defined Programs

The formulations of goals, purposes, needs, and characteristics of programs to come out of the 1984 Vocational Study Committee should provide a basis for considering this option. From all indications at present, no state will move dramatically with new technical level programs that depend heavily for support from the local tax base. The most promising source of support is the taxing capacity of the state. Witness the most dramatic development in education in the last quarter of a century has been in the growth of community colleges and other institutions of higher education. All have been supported directly and largely from state-collected taxes.

It may well be that the most crucial needs in vocational education are in those levels of knowledge and skills that can be provided most appropriately in higher education.

Option 3: Overhaul of Present Fiscal Methods

There is much to be said for a general overhaul of present funding mechanisms for public elementary and secondary schools. This is a generalization applicable to most states. Only a few have made significant improvements in the last decade. Unfortunately, some that made promising changes over a decade ago have regressed during the economic difficulties of the past five years. The need for fiscal revisions are not urgent solely for vocational, special education, science or any other area, but for the total educational system.

The picture in higher education is different. Program components are somewhat clearer due largely to the high degree of specialization. Supportive services may be fully as ambiguous and difficult to associate with relevant instructional functions. At both levels, there are great needs for revising information systems to improve (1) procedures for distribution of funds, and (2) evaluation of educational outcomes.

Option 4: Combination of Options 1 and 2

Increased funds for present programs, aside from offsetting the costs of inflation, should be contingent on continuing improvements.

The first one is to retain vocational education as a component of the secondary school, certainly with some trimming and enrichment of present programs. The second one is to develop a better union of the academic and the vocational components. Many students fail to progress in development of conceptual knowledge and skills because of inadequate knowledge in the academic areas of their programs. The third assumption is that vocational programs at the secondary level should be better articulated with comparable areas in community colleges and other post-secondary institutions. For example, achievement levels in articulated programs can be recognized by advanced placement in college, thus enabling students to progress to higher technical levels commensurate with their ability.

The other portion of this option, namely direct allocation of state funds to new programs, can be provided to secondary schools and/or area vocational centers and to post-secondary institutions. Higher education will have responsibility for developing these programs, such as laser technology, robotics, computer science, high level energy technology, micro-precision technology, and others. It is estimated that at least one year of introductory work can be completed at the secondary level at much less expense to the state and the individual than at the college level assuming proper planning and articulation.

TABLES

Table 1

Selected Social and Economic Characteristics for Missouri and the United States

	Missouri	United States
Age: (1980)		
Under 18	27.7%	28.1%
Over 64	13.2%	11.3%
Median Age	30.8 years	30.0 years
Education: (1980)		
High School Graduates	63.5%	68.6%
Completed 4 or more years of college	13.9%	17.0%
Median Years of Education	12.4 years	12.5 years
Race and Origin (1980)		
Black	10.5%	11.7%
Spanish Origin	1.1%	6.4%
Population - Avg. Annual % Change		
1960 to 1970	0.8%	1.3%
1970 to 1980	0.5%	1.2%
Nonagric. Employment - Avg. Annual % Change		
1960 to 1970	+ 1.4%	+ 2.0%
1970 to 1980	+ 1.9%	+ 2.6%
Labor Force Participation Rate		
Male 1970	75.3%	79.7%
1980	74.3%	77.4%
Female 1970	41.0%	43.3%
1980	49.3%	51.5%
Total 1970	57.2%	60.4%
1980	61.1%	63.8%
Unemployment Rates		
1976	6.2	7.7
1977	5.9	7.1
1978	5.0	6.1
1979	4.5	5.8
1980	7.2	7.1
1981	7.7	7.6

Source: Employment and Training Report of the President, 1982; U.S. Department of Commerce, Bureau of the Census, General Population Characteristics, Missouri and United States Summary, 1980; General Social and Economic Characteristics: Missouri, 1980; Statistical Abstract, 1981.

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Table 2

Employment and Net Job Change
By Industry in Missouri, 1972-1982

Industry	1982 Employment (000's)	Average Annual Percent Change 1975-1979	1979-1982	Net Change in Jobs 1972-1982 (000's)
Mining	7.1	- 2.2%	- 4.5%	- 1.6
Construction	74.3	+ 8.2	- 6.5	+ 1.5
Manufacturing	407.3	+ 4.9	- 4.1	- 34.2
Nondurable Goods	180.4	+ 2.4	- 2.6	- 15.3
Food	45.1	+ 0.5	- 1.9	- 5.1
Textile & Apparel	25.5	- 0.7	- 5.8	- 9.3
Paper	12.3	+ 2.6	- 3.4	- 1.2
Printing	37.1	+ 2.6	+ 0.4	+ 3.7
Chemicals	28.4	+ 3.2	- 1.4	+ 2.8
Leather	20.2	+ 1.4	- 4.2	- 6.4
Other Nondurables	11.8	+ 6.9	- 1.4	+ 0.4
Durable Goods	226.9	+ 6.9	- 5.2	- 18.9
Lumber	8.5	+ 8.5	- 8.5	- 2.1
Furniture	8.3	+ 5.1	- 1.9	- 0.1
Stone, Clay & Glass	10.4	+ 3.6	- 9.3	- 2.7
Primary Metals	13.5	+ 3.8	- 6.5	- 0.4
Fabricated Metals	27.6	+ 2.4	- 6.2	- 7.7
Mach., exc. Elect.	33.2	+ 4.9	- 5.0	0.0
Elect. & Elect. Equip.	47.3	+ 7.2	- 0.3*	+ 8.4*
Transportation	58.7	+ 5.5	- 6.8	- 12.1
Motor Vehicles & Equip	28.4	+ 6.9	-14.5	- 14.2
Other Transportation	38.2	+ 4.7	+ 0.6	+ 2.1
Instruments	12.0	+ 7.5	- 0.7*	- 1.4*
Misc. Mfg. Ind.	7.4	+ 1.8	- 5.6	- 1.6
Trans., Comm. Pub. Util.	131.5	+ 3.9	- 2.5	+ 6.7
Wholesale Trade	134.5	+ 4.5	- 0.8	+ 22.2
Retail Trade	324.5	+ 3.5	- 1.2	+ 49.7
Finance, Insur., Real Estate	108.4	+ 3.6	- 0.2	+ 15.8
Services	404.2	+ 5.7	+ 1.8	+129.1
Government	324.4	+ 1.8	- 1.4	+ 26.9
Federal	67.0	- 0.4	- 0.3	- 1.6
State and Local	257.4	+ 2.4	- 1.1	+ 28.5
Total Non-Agric. Emp.	1916.2	+ 3.9	- 1.6	+216.1

* Data for these two industries for 1982 are not comparable with prior years due to industry code changes. Average Annual Percent Change is calculated for 1977 to 1981 and Net Change in jobs is for 1972 to 1981.

Source: Missouri Division of Employment Security

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Table 3

Distribution of Wage and Salary Employment By Industry, Missouri and the United States, 1982

Industry	Missouri	United States
Agriculture	0.3%	0.6%
Forestry & Fishing	0.0	0.0
Mining	0.4	1.2
Construction	3.6	4.1
Manufacturing	20.2	20.0
Nondurable Goods	9.1	8.2
Food & Kindred	2.3	1.7
Textile Mill Products	0.0	0.8
Apparel & Other Textile Products	1.2	1.2
Paper & Allied	0.6	0.7
Printing & Publishing	1.8	1.4
Chemicals & Allied	1.4	1.1
Petroleum & Coal	0.1	0.2
Tobacco	0.0	0.1
Rubber & Misc. Plastics	0.6	0.7
Leather	1.0	0.2
Durable Goods	11.1	11.7
Lumber & Wood Prod.	0.4	0.6
Furniture & Fixtures	0.4	0.5
Primary Metal	0.7	1.0
Fabricated Metal Prod.	1.4	1.5
Machinery, exc. Elect.	1.6	2.4
Electrical Machinery	2.3	2.1
Transportation Equip., exc. Motor Vehicles	1.7	1.1
Motor Vehicles & Equipment	1.1	0.7
Stone, Clay & Glass	0.5	0.6
Instruments	0.6	0.8
Misc. Mfg.	0.4	0.4
Trans., Comm. & Pub. Util.	6.7	5.4
Wholesale Trade	6.7	5.6
Retail Trade	16.4	16.1
Finance, Insurance and Real Estate	5.6	5.8
Services	22.0	21.6
Government	18.0	19.7
Total	100.0%	100.0%

Totals may not sum to 100.0% due to rounding.

Source: Bureau of Economic Affairs.

Table 4

Average Annual Earnings By Industry for Year-Round Full-time Workers in Missouri, 1979

Industry	Average Annual Earnings
Agriculture	$ 9,271
Fishing & Forestry	11,728
Mining	17,878
Construction	16,517
Manufacturing	14,959
Nondurable Goods	13,821
Food and Kindred	15,692
Textile Mill Products	12,248
Apparel	8,635
Paper and Allied	14,342
Printing and Publishing	14,681
Chemicals	17,272
Petroleum & Coal	18,496
Rubber	13,847
Other Nondurables	8,819
Durable Goods	15,784
Lumber & Wood	9,660
Furniture	11,360
Stone, Glass and Clay	16,143
Primary Metals	16,712
Fabricated Metals	15,791
Mach., exc. elect.	15,137
Electrical Equip.	14,035
Transportation Equip.	18,475
Motor Vehicle Equip.	17,585
Aircraft & Space Vehicles	19,789
Other Transportation Equipment	15,175
Instruments	13,884
Misc. Manufacturing	11,068
Trans., Comm., & Public Utilities	18,643
Wholesale Trade	15,179
Retail Trade	11,782
Finance, Insurance, & Real Estate	13,527
Services	11,966
Public Administration	14,353
All Industries	$14,058

Source: U.S. Department of Commerce, Bureau of the Census, Detailed Characteristics of the Population: Missouri, 1980.

Table 5

Average Hourly Earnings (AHE) of Production Workers in Manufacturing, for Missouri, and the United States, 1982

	United States	Missouri	
	AHE	AHE	MO AHE as % of US AHE
Total Manufacturing	$ 8.50	$ 8.46	99.5
Nondurable Goods	7.73	7.57	97.9
Food & Kindred	7.89	8.49	107.6
Textile Mill	5.83	5.13	—
Apparel	5.20		—
Paper & Allied	9.32	8.02	85.8
Printing & Publishing	8.75	8.70	99.4
Chemicals	9.96	9.59	96.3
Leather	5.32	5.03	94.5
Durable Goods	9.06	9.17	101.2
Lumber	7.46	5.40	72.4
Stone, Clay & Glass	8.86	9.05	102.1
Primary Metals	11.33	11.40	100.6
Fabricated Metals	8.78	8.87	101.0
Machinery, exc. Elect.	9.29	9.29	100.0
Elect. & Elect. Equipment	8.21	8.33	101.5
Transportation Equipment	11.12	11.74	105.6
Instruments	8.10	6.79	83.8
	8.10	6.79	83.8

Source: Missouri Division of Employment Security; U.S. Department of Labor, Bureau of Labor Statistics, unpublished tapes.

Table 6

Employment by Occupation, Missouri, 1970 and 1980

	1970		1980		Annual Average Absolute Change 1970 - 1980	Annual Average Percent Change 1970 - 1980
Occupational Category	Number	Percent	Number	Percent		
Managerial & Prof. Specialties	312,881	17.7%	439,989	20.9%	+12,711	+4.1%
Exec., Admin., & Managerial	128,992	7.3	200,819	9.5	+ 7,183	+5.6
Professional Specialties	183,889	10.4	239,170	11.4	+ 5,528	+3.0
Technical, Sales & Admin. Support	517,307	29.3	632,053	30.0	+11,475	+2.2
Technicians & Technologists	36,744	2.1	60,071	2.9	+ 2,333	+6.4
Sales	181,014	10.2	214,071	10.2	+ 3,306	+1.8
Admin. Support (incl. Clerical)	299,549	16.9	357,911	17.0	+ 5,836	+2.0
Service Occupations	225,105	12.7	285,478	13.6	+ 6,037	+2.7
Farming, Forestry & Fishing	90,457	5.1	88,836	4.2	- 162	-0.2
Precision (Production) Craft, and Repair	243,058	13.8	256,371	12.2	+ 1,331	+0.6
Operatives, Fabricators & Laborers	378,483	21.4	401,180	19.1	+ 2,270	+0.6
Total	1,767,291	100.0%	2,103,907	100.0%	+33,662	+1.9%

Percentages may not sum to 100.0% due to rounding.

Source: U.S. Department of Commerce, Bureau of the Census, Detailed Population Characteristics: Missouri, 1980.

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Table 7

Occupational Distribution of Industries Accounting for Greatest Job Growth and Job Loss in Missouri, 1972-1982*

Occupation	Job Growth Services	 Retail	 Wholesale	 Finance, Insurance & Real Estate	Job Loss Motor Vehicle & Equip.	 Textiles & Apparel	 Fabricated Metals	 Leather**
Managerial & Prof. Specialties	47.3%	11.5%	15.9%	20.5%	7.1%	6.1%	12.9%	5.1%
Exec., Admin., & Managerial	7.1	9.4	14.7	19.0	4.8	4.8	8.7	4.0
Professional Specialties	40.2	2.1	1.2	1.5	2.3	1.3	4.2	1.1
Technical, Sales & Admin. Support	24.6	46.9	47.8	72.4	9.6	11.1	16.8	14.1
Technicians & Technologists	6.6	0.2	1.0	1.1	1.0	0.4	3.4	0.1
Sales	0.6	37.3	24.9	24.7	1.1	2.1	2.0	2.3
Admin. Support (incl. Clerical)	17.4	9.4	21.9	46.6	7.5	8.6	11.3	11.7
Service Occupations	23.7	22.6	1.5	4.5	2.9	1.9	2.2	1.6
Farming, Forestry & Fishing Occ.	0.2	0.1	0.2	0.6	0.0	0.0	0.0	—
Precision Production, Craft, and Repair Occ.	1.5	8.0	10.7	1.1	16.8	9.6	23.1	78.4
Mechanics, Repair, Extractive & Construction Trades	0.9	4.8	6.8	0.9	8.6	1.5	8.0	
Precision Production	0.6	3.2	3.9	0.2	8.2	8.2	15.1	
Operatives, Fabricators & Laborers	2.5	11.0	23.8	1.0	63.5	71.2	45.0	
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Columns may not sum to 100.0% due to rounding.

* Not including the "Government" sector. In the U.S. Census data "public administration" is limited to regular government functions such as legislative, judicial, administrative and regulatory activities of governments. Other government organizations such as schools, hospitals and bus lines are classified by industry according to the activity in which they are engaged. Hence most of the increase in government jobs (+26,900) as classified by the CES data in the state will appear under "Services" on this table.

** Census data not available for this industry. Used the Missouri Division of Employment Security and the U.S. Bureau of Labor Statistics, Missouri Occupational Staffing Patterns for Manufacturing, April, May, June, 1980, 1982.

Source: U.S. Department of Commerce, Bureau of the Census, Detailed Population Characteristics: Missouri, 1980; Missouri Division of Employment Security and the U.S. Bureau of Labor Statistics, Staffing Patterns, (see above).

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Table 8

Distribution of Female Workers
By Industry, Missouri, 1980

Industry	Number of Females Employed	Percent of all Female Workers	Females as a Percent of All Workers
Agriculture	14,264	1.6%	16.1%
Forestry and Fisheries	231	0.0	20.6
Mining	963	0.1	9.9
Construction	9,404	1.0	7.9
Manufacturing	154,925	17.0	33.6
Nondurable Goods	87,509	9.6	45.3
Food and Kindred	12,322	1.4	28.4
Textile and Apparel	23,154	2.5	79.2
Printing and Publishing	16,464	1.8	44.0
Chemicals	10,108	1.1	31.2
Other Nondurables	5,368	0.6	10.6
Durable Goods	67,416	7.4	25.1
Furniture, Lumber, and Wood	4,454	0.5	20.6
Primary Metals	3,409	0.4	15.3
Fabricated Metals	7,009	0.8	20.9
Mach., exc. elect.	8,665	1.0	22.2
Electrical Equip.	21,619	2.4	46.3
Transportation Equip.	10,459	1.1	14.9
Other Durables	11,801	1.3	33.3
Trans., Comm., & Pub. Utils.	41,485	4.6	24.0
Wholesale Trade	27,248	3.0	26.4
Retail Trade	175,557	19.3	51.2
Finance, Insur. and Real Estate	68,122	7.5	59.4
Services	371,869	40.9	63.0
Public Administtation	45,447	5.0	45.0
All Industries	909,515	100.0%	43.2%

Columns may not sum to 100.0% due to rounding.

Source: U.S. Department of Commerce, Bureau of the Census, Social and Economic Characteristics: Missouri, 1980.

Table 9

Distribution of Female Workers
By Occupation, Missouri, 1980

Occupation	Number of Females Employed	Percent of All Female Workers	Females as a Percent of all Workers
Managerial & Prof. Specialties	183,835	20.2%	41.8%
Exec., Admin., & Managerial	60,897	6.7	30.3
Professional Specialties	122,938	13.5	51.4
Technical, Sales & Admin. Support	407,193	44.8	64.4
Technicians & Technologists	28,377	3.1	47.2
Sales	100,096	11.0	46.8
Admin. Support (Incl. Clerical)	278,720	30.6	77.9
Service Occupations	174,915	19.2	61.3
Farming, Forestry & Fishing Occupations	12,312	1.4	13.9
Precision Production, Craft, and Repair	20,607	2.3	8.0
Operatives, Fabricators & Laborers	110,653	12.2	27.6
All Occupations	909,515	100.0%	43.2%

Columns may not sum to 100.0% due to rounding.

Source: U.S. Department of Commerce, Bureau of the Census, Social and Economic Characteristics, Missouri, 1980.

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Table 10

Projected Employment, By Industry, Missouri 1976 to 1985

Industry	Average Annual Percentage Change 1976 to 1985	Annual Change in Employment 1976 to 1985
Agriculture	- 3.5%	- 3,882
Mining	- 0.7	- 7
Construction	+ 1.5	+ 1,732
Manufacturing	+ 0.8^r	+ 3,478
Nondurable Goods	+ 0.6	+ 1,229
Food & Kindred	+ 0.4	+ 164
Textile & Mill Products	- 2.8	- 37
Apparel	- 1.3	- 410
Paper & Allied	+ 0.9	+ 118
Printing & Publishing	+ 1.5	+ 517
Chemical & Allied	+ 1.1	+ 309
Leather	+ 0.6	+ 124
Other Nondurables	+ 3.7	+ 441
Durable Goods	+ 0.9^r	+ 2,250
Lumber & Wood Prod.	+ 1.6	+ 188
Furniture	+ 2.1	+ 168
Stone, Clay & Glass	- 1.2	- 147
Primary Metals	+ 1.9	+ 280
Fabricated Metals	+ 1.3	+ 378
Mach., exc. elect.	+ 0.6	+ 231
Elect. & Elect. Equip.	+ 1.9	+ 823
Transportation Equip.	- 0.1^r	- 71
Motor Vehicle Equip	- 2.8^r	- 897
Other Trans. Equip.	+ 2.1	+ 826
Instruments	+ 3.5	+ 250
Misc. Mfg.*	+ 1.3	+ 149
Trans., Comm., & Pub Util.	+ 1.4^r	+ 2,036
Wholesale	+ 1.0	+ 1,121
Retail	+ 1.2^r	+ 4,254
Finance, Insurance, & Real Estate	+ 1.7^r	+ 1,683
Services	+ 2.3^r	+12,896
Public Administtation	+ 0.0	+ 523
Net Total Nonagric. Employment	+ 1.2%	+23,834

^{r}Revised in May 1981

*Includes Ordnance

Source: Missouri Division of Employment Security, and U.S. Bureau of Labor Statistics, Missouri Employment Outlook Projections for 1985, 1980. (Updated May 1981.)

Table 11
Projected Employment, by Occupation, Missouri
1976 to 1985

Occupational Category	Average Annual Projected Change 1976 to 1985	Average Annual Number of Job Openings Due to Growth	Due to Replacement	Total
Professional, Technical & Kindred	+ 1.2%	+3,586	+10,240 (74.1%)	+13,826
Managers, Officials & Proprietors	+ 1.5	+3,349	+ 9,510 (74.0%)	+12,859
Sales Workers	+ 1.3	+1,729	+ 6,340 (78.6%)	+ 8,069
Clerical Workers	+ 2.0	+7,529	+14,800 (66.3%)	+22,329
Craft & Kindred	+ 1.3	+3,129	+ 7,400 (70.3%)	+10,529
Operatives	+ 1.2	+3,574	+ 8,350 (70.0%)	+11,924
Service Occupations	+ 1.6	+4,564	+ 4,560 (50.0%)	+ 9,124
Laborers, exc. farm	+ 0.3	+ 289	+ 2,670 (90.2%)	+ 2,963
Farmers & Farm Workers	- 3.7	- 3,651	+ 6,270 (100.0%)	+ 2,619
All Occupations	+ 1.3	+24,098	+70,140 (74.4%)	+94,238

Source: Missouri Division of Employment Security and U.S. Bureau of Labor Statistics, Missouri Employment Outlook Projections for 1985, 1980. (Updated May 1981)

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Table 12

Detailed Occupations with the Largest Number of Projected Job Openings in Missouri, 1976 to 1985

Occupation	Projected Average Annual Job Openings, 1976-1985			Median Earnings of Full Time Workers, 1979		Percent Female,1980
	Growth	Replacement	Total	Male	Female	
Professional, Technical & Kindred						
Engineers, Technical	330	590	920	$23,528	$16,102	4.0%
Registered Nurses	370	880	1,250	15,916	14,558	94.1
Health Technicians & Technologists	250	330	580	13,406	10,424	81.6
Elem. School Teachers	420	1,680	2,100	15,189	11,396	64.6
Accountants	200	870	1,070	19,397	12,264	37.0
Clergy	360	440	800	*	*	6.0
Lawyers	130	560	680	31,155[a]	17,480[a]	12.9
Social Workers	210	330	530	13,537	11,771	67.1
Managers, Officials & Proprietors						
Bank, Financial Managers	260	470	730	*	*	28.1
Sales Manager, exc. Retail Trade	270	240	520	*	*	*
Restaurant, Cafe & Bar Managers	110	540	650	*	*	44.4
Office Managers, NEC[b]	280	350	630	*	*	*
Other Managers, Admin.	1,670	5,910	7,580	*	*	*
Sales Occupations						
Insurance Agents, Brokers	90	430	520	*	*	24.8
Real Estate Agents, Brokers	200	770	960	*	*	47.2
Sales and Sales Workers, NEC	1,240	4,550	5,780	*	*	*
Clerical Occupations						
Secretaries	2,400	3,190	5,590	17,175	9,459	99.1
Typists	270	1.120	1,400	11,022	7,916	98.7
Bookkeepers	190	1,700	1,900	15,260	9,309	89.1
Cashiers	840	1,170	2,010	12,784	7,853	78.2
Counter Clerks, exc. Food	290	500	790	*	*	79.2
Estimators, Investigators NEC	90	440	530	*	*	*
Receptionists	210	510	720	11,022	7,916	96.9
Misc. Clerical Workers NEC	2,560	1,670	4,230	*	*	*
Crafts and Kindred						
Carpenters and Apprentices	220	880	1.090	14,177	10,941	0.8
Printers and Apprentices	170	430	600	*	*	*
Plumbers, Pipefitters and Apprentices	220	290	510	19,589	15,962	0.4
Blue Collar Worker Supervisors, NEC	300	710	1,010	*	*	*

Table 12 (continued)

Occupation	Projected Average Annual Job Openings, 1976-1985			Median Earnings of Full Time Workers, 1979		Percent Female, 1980
	Growth	Replacement	Total	Male	Female	
Auto Mechanics and Apprentices	200	510	710	$13,339	$12,337	0.8%
Heavy Equip. Mechanics, incl. Diesel	80	420	500	*	*	0.7
Operatives						
Welders & Flamecutters	250	330	580	14,845	9,348	5.8
Checkers, Examiners exc. Mfg.	410	410	820	*	*	51.8
Packer, Wrapper, exc. Meat, Produce	310	420	730	13,363	9,178	65.7
Assembers	980	640	1,620	15,325	9,428	40.5
Sewers & Stitchers	60	750	810	*	*	*
Misc. Machine Operatives	180	710	890	13,457	9,390	34.7
Operatives, NEC	180	730	910	14,066	9,681	37.3
Delivery & Route Workers	250	420	670	*	*	*
Truck Drivers	410	900	1,310	16,248	11,174	1.8
Service Occupations						
Lodging Quarters Cleaners, exc. Private	420	270	680	10,332	7,187	26.6
Building Interior Cleaners, NEC	430	1,340	1,770			
Janitors & Sextons	270	1,960	2,230			
Cooks, Exc. Private	600	1,370	1,970	8,252	6,601	66.1
Food Counter, Fountain Workers	300	390	690	9,333	5,822	86.7
Waiters/ Waitresses	500	1,000	1,500			
Food Workers, NEC, exc. Private	150	490	630			
Health Aides, Exc. Nursing	270	250	520			
Nurses Aides, Orderlies	390	1,060	1,450	7,962	7,154	89.2
Practical Nurses	350	490	850	10,684	9,883	96.4
Child Care Workers, exc. Private	590	640	1,230	*	*	94.5
Guards	260	1,000	1,260	11,118	8,780	13.8
Laborers						
Construction, exc. Carpenter Help	170	370	530	*	*	*
Freight Material Handlers	120	410	530	14,515	8,660	12.0
Gardeners, Groundskeepers, Exc. Farm	-40	570	530	*	*	6.3
Stock Handlers	50	440	490	14,515	8,660	12.0
Farm Occupations						
Farmers and Farm Managers	-3,650	6,270	2,620	9,678	3,706	7.3

[a] Lawyers and Judges.

*Not available

Note: These occupational projections were not revised in 1981 when the industrial projections upon which they are based were revised.

Source: Projections: Missouri Division of Employment Security and the U.S Bureau of Labor Statistics, Missouri Employment Outlook Projections for 1985, 1980. Earnings and percent female: U.S. Department of Commerce, Bureau of the Census, Detailed Characteristics of the Population: Missouri, 1980.

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Table 13

Selected* Occupations with Total Projected Job Openings of Less Than 100 per year in Missouri, 1976-1985

Occupation	Projected Average Annual Job Openings 1976 - 1985
Professional and Technical:	
Chemical Engineers	30
Metallurgical Engineers	20
Petroleum Engineers	0
Mathematical Specialists	40
Industrial Engineering Technicians	20
Mechanical Engineering Technicians	10
Veterinarians	10
College and University Teachers	-40
Foresters, Conservationists	20
Managers:	
Credit Managers	40
Funeral Directors	40
Clerical Occupations:	
Stenographers	-10
Duplicating Machine Operators	10
Keypunch Operators	-120
Tabulating Machine Operators	0
Craft and Kindred:	
Floor Layers, exc. Tilesetters	10
Plasterers & Apprentices	10
Tilesetters	20
Blacksmiths	10
Millwrights	40
Pattern and Model Makers	40
Rollers & Finishers	10
Data Processing Machine Repairers	80
Office Machine Repairers	70
Photoengravers, Lithographers	70
Loom Fixers	0
Engravers, Exc. Photoengravers	10
Telephone Line Installers, Splicers	10
Carpet Installers	40
Cabinet Makers	80
Jewelers & Watchmakers	50
Opticians, Lens Grinders, Polishers	50
Tailors	70
Upholsterers	50
Dental Lab Technician	40
Furniture and Wood Finishers	20
Glaziers	40
Sign Painters and Letterers	40

Table 13 (Continued)

Occupation	Projected Average Annual Job Openings 1976-1985
Operatives:	
Drill Press Operatives	10
Grinder Machine Operatives	10
Solderers	-10
Knitters, Loopers and Toppers	0
Spinners, Twisters and Winders	0
Weavers	0
Lathe, Milling Machine Operatives	50
Filers, Polishers, Sanders & Buffers	70
Shoemakers, Machine Operatives	60
Service Occupations:	
Marshalls and Constables	0
Ushers, Recreation, Amusement	10
Cooks, Private Household	20
Boarding, Lodging Housekeepers	80
Welfare Service Aides	90
Laborers:	
Fishers, Hunters and Trappers	-10
Timbercutting, Logging Workers	40
Teamsters	-10
Garbage Collectors	70

*
All occupations that are anticipated to have less than 100 job openings per year are not listed given their large number. Those not listed fall into one of two categories: (i) extremely detailed occupations, such as weighers, utility meter readers, or motion picture projectionists; and (ii) occupations for which vocational and technical education does not train, such as podiatrists, physicists, or judges.

Source: Missouri Division of Employment Security and the U.S. Bureau of Labor Statistics, Missouri Employment Outlook Projections for 1985, 1980.

Table 14

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

Occupational Cluster	Projected Openings			Estimated Training Program Completions			
	Curr. Emp.	Proj. Emp.	Avg. Ann. Openings	Vocational	Proprietary	CETA/Job Corps	Total Supply
Agriculture Production (0001)	65,724	43,896	2,440	1,715	19	0	1,734
Agriculture Business (0002)	19,304	21,147	1,009	375	0	0	375
Agriculture Mechanics (0003)	7,085	6,719	309	2,290	0	15-C	2,305
Horticulture & Landscaping (0004)	12,065	11,072	642	217	39	0	256
Forestry Logging & Lumber (0005)	4,362	4,667	162	58	0	0	58
Medical Records Technician (0101)	571	678	29	54	0	0	54
Dental Assistant (0102)	2,665	3,017	250	137	280	2-J	419
Dental Hygienist (0103)	327	665	57	92	0	0	92
Dental Lab Technician (0104)	1,341	1,357	44	22	0	0	22
Medical Lab Technician (0105)	4,739	5,885	278	145	98	0	243
Licensed Practical Nurse (0106)	9,276	12,452	845	994	0	44-C 2-J	1,040
Medical-Nursing Assist. (0107)	21,331	24,595	1,217	647	873	113-C 76-J	1,709
Human Health Services (0108)	13,000	15,273	782	1,002	9	0	1,011
Treatment Service (0109)	6,183	7,268	337	274	15	0	289
Radiologic Technician (0110)	2,075	2,664	124	50	117	0	167
Registered Nurse (0112)	19,619	22,982	1,252	1,415	566	0	1,981
Electric Occupations (0202)	24,934	28,340	964	214	149	55-C	418
Electronic Occupations (0203)	18,485	23,218	868	1,006	296	63-C	1,365
Civil Technology (0204)	1,511	1,776	57	36	1	0	37
Chemical Technology (0205)	2,153	2,242	46	23	0	0	23
Sanitation & Public Health (0206)	6,059	5,921	213	6	175	0	181
Industrial Technology (0207)	356	428	15	44	232	0	276

Table 14 (cont.)

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

Occupational Cluster	Projected Openings			Estimated Training Program Completions			
	Curr. Emp.	Proj. Emp.	Avg. Ann. Openings	Vocational	Proprietary	CETA/Job Corps	Total Supply
Mechanical Technology (0208)	312	338	9	55	5	27-C	87
Jewelry & Watchmaking (0209)	953	986	53	0	35	0	35
Air Conditioning & Refrigeration (0210)	7,515	9,131	399	454	412	13-C	879
Textile Tech. & Leatherworking (0211)	37,774	39,367	1,974	273	124	16-C	413
Food Production, Management & Services (0212)	116,987	134,691	6,731	2,028	464	64-C 88-J	2,644
Commercial Aviation (0213)	7,020	9,304	405	127	409	0	536
Brick & Stonemasons (0302)	3,948	4,095	108	104	0	11-J	115
Carpentry & Other Construction Trades (0304)	58,285	66,307	2,829	1,928	125	189-C 96-J	2,338
Plumbers & Pipefitters (0395)	8,338	10,285	509	29	10	0	39
Heavy Equipment Mechanics & Operators (0306)	40,606	45,466	1,578	237	431	53-C 19-J	740
Automotive Mechanics (0308)	29,286	30,975	832	1,994	252	76-C 36-J	2,358
Mechanics, Except Automotive (0303)	4,322	4,518	192	310	52	22-C	384
Automobile Body Repair (0310)	5,486	5,847	136	729	91	117-C	937
Drafting (0312)	10,060	11,775	331	482	163	63-C	708
Printing & Graphic Arts (0314)	23,578	25,074	879	672	115	18-C	805
Woodworking (0315)	6,492	7,524	309	110	0	0	110
Machinists-Tool and Die Makers (0316)	29,891	31,884	1,020	478	81	229-C	788
Sheet Metal Occupations (0318)	9,580	11,216	396	99	0	40-C	139
Welding Occupations (0319)	15,255	17,336	570	787	405	297-C 73-J	1,562

Table 14 (cont.)

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

Occupational Cluster	Projected Openings			Estimated Training Program Completions			
	Curr. Emp.	Proj. Emp.	Avg. Ann. Openings	Vocational	Proprietary	CETA/Job Corps	Total Supply
Other Metal Working Occupations (0320)	9,692	11,326	422	76	0	0	76
Emergency Medical Tech (0441)	1,624	1,922	99	17	11	0	28
Police Science (0442)	24,378	28,234	1,725	286	43	0	329
Fire & Fire Safety (0443)	5,079	5,[illegible]4	99	58	0	0	58
Advertising (0551)	2,786	3,539	246	208	0	0	208
Recreation & Tourism (0552)	3,683	4,348	228	169	24	0	193
Real Estate Marketing (0553)	11,555	13,930	1,263	34	7,682	0	7,716
Insurance Marketing (0554)	16,546	17,869	709	34	0	0	34
Marketing (0555)	176,149	201,228	9,731	5,090	872	0	5,962
Vehicle Operator (0611)	61,655	65,638	2,159	27	1,028	21-C	1,076
Custodial Services (0612)	50,449	56,773	4,004	53	85	3-C 24-J	165
Barbering (0613)	2,780	2,843	187	0	72	0	72
Cosmetology (0614)	12,897	12,384	409	137	1,772	0	1,909
Child Care Services (0615)	21,824	26,266	1,725	354	0	0	354
Mortuary Services (0616)	1,394	1,341	73	20	0	0	20
Hotel-Institution Services (0617)	12,177	16,685	1,302	173	0	0	173
Keypunch Operators (0731)	9,019	6,093	- 108	355	342	43-C 3-J	743
Computer Operator (0732)	6,858	7,237	158	250	0	0	250
Computer Science (0733)	12,552	14,229	340	1,122	769	0	1,891
Bookkeeping & Accounting (0921)	69,515	75,673	3,555	1,961	748	2-J	2,711
General Office Clerical/Typing (0922)	102,236	132,117	7,807	5,866	398	417-C 107-J	6,788
Communications Occupations (0923)	35,084	35,490	1,232	24	38	21-J	83

Table 14 (cont.)

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

Occupational Cluster	Projected Openings			Estimated Training Program Completions			
	Curr. Emp.	Proj. Emp.	Avg. Ann. Openings	Vocational	Proprietary	CETA/Job Corps	Total Supply
Secretary-Steno (0925)	77,689	98,276	5,568	1,839	473	204-C	3,208
Office Administration & Management (0926)	18,329	21,982	1,167	253	165	0	418
Inventory Support Occupations (0927)	22,976	26,285	1,034	0	0	5-C 13-J	18

Source: Missouri State Plan for FY1984, Appendix A

Table 15

Distribution of Employment by Industry in Four Service Delivery Areas (SDA's) in Missouri, 1982

Industry	Service Delivery Area 003 (Kansas City-North)	005 (Central Missouri)	006 (St. Louis City)	011 (Boothill)
Agriculture, Forestry & Fisheries	0.8%	0.6%	0.1%	2.5%
Mining	0.1	0.5	0.0	2.1
Construction	3.2	10.2	3.3	4.4
Manufacturing	20.2	19.6	26.3	30.1
Nondurable Goods Mfg.	10.3	8.2	15.5	14.9
Food and Kindred	3.1	1.8	6.0	2.0
Textile and Apparel	0.6	1.4	1.6	3.7
Paper & Allied	1.3	0.2	0.4	1.5
Printing and Publishing	1.9	2.2	2.9	1.3
Chemicals	0.2	1.5	3.1	0.1
Leather	0.0	0.8	0.6	5.4
Other Nondurables	1.6	0.4	0.7	0.9
Durable Goods Mfg.	9.9	11.4	10.8	15.2
Lumber, Wood and Furniture	0.6	0.5	0.7	2.2
Primary Metals	0.2	0.0	0.7	2.6
Fabricated Metals	1.6	0.9	2.9	1.5
Mach., exc. elect.	1.5	0.9	2.8	1.5
Elect. Machinery	0.6	4.4	0.7	2.2
Transportation Equip.	*	0.2	2.0	1.7
Instruments	0.1	1.0	0.4	0.0
Other Durables & Misc. Mfg.	5.3*	3.5	0.7	3.5
Trans., Comm., & Pub. Utils.	20.4	6.3	9.6	6.8
Wholesale Trade	11.6	7.6	9.7	7.5
Retail Trade	22.6	24.8	12.5	22.9
Finance, Insur. and Real Estate	4.6	8.1	9.0	4.4
Services	16.6	22.2	29.4	19.3
Total	100.0%	100.0%	100.0%	100.0%

Columns may not sum to 100.0% due to rounding.

* For SDA 003, the transportation equipment industry is included with other durables and misc. manufacturing.

Source: Missouri Division of Employment Security, Research and Analysis Section.

Table 16

Employment in "High Technology" Industries as a Percent of Private Non-farm Employment for Selected States and the U.S., 1980

		West North Central States								
	U.S.	Missouri	Minnesota	Iowa	S. Dakota	N. Dakota	Nebraska	Kansas	Massachusetts	California
High Technology*	3.0	1.6	4.1	2.1	2.1	0.1	2.9	1.5	6.3	5.6
Narrow Definition	4.6	3.9	6.3	3.7	2.6	0.2	3.2	2.3	8.4	7.6
Mass. DES Definition	6.4	6.5	6.8	4.3	2.8	0.7	3.5	9.1	9.4	9.8

* See Table __ for the industries included in these definitions.

Calculations by Lynn Browne at the Federal Reserve Bank of Boston. Source of data: U.S. Department of Commerce, County Business Patterns

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Table 17

"High Technology" Employment in Missouri, 1980

			Employment
I.	Core/Narrow Definition		26,292
	SIC 283	Drugs	5,705
	SIC 357	Office and Computing Machines	392
	SIC 366	Communication Equipment	6,442
	SIC 367	Electronic Components and Accessories	8,776
	SIC 381	Engineering and Scientific Instruments	335
	SIC 382	Measuring and Controlling Devices	1,599
	SIC 383	Optical Instruments and Lenses	265
	SIC 384	Medical Instruments and Supplies	2,585
	SIC 386	Photographic Equipment and Supplies	193
II.	MA Division of Employment Security Definition		65,773
	SIC 283	Drugs	5,705
	SIC 348	Ordnance	8,286
	SIC 357	Office and Computing Machines	392
	SIC 36	Electrical and Electronic Equipment	42,023
	SIC 376	Guided Missiles and Space Vehicles	3,450*
	SIC 379	Misc. Transportation Equipment	380
	SIC 38	Instruments	5,237
III.	Broad Definition		109,138
	Definition II & Rest of SIC 28	Chemicals	18,145
	SIC 372	Aircraft	25,220*

*Estimate

Source: U.S. Department of Commerce, Country Business Patterns, 1980.

Table 18

Occupational Distribution of the Largest "High Technology" Manufacturing Industries in Missouri, 1980

Occupation	Electrical & Electronic Equipment	Aircraft & Space Vehicles	Chemicals
Managerial & Prof. Specialties	13.4%	32.8%	22.3%
Exec., Admin., & Managerial	6.9	9.4	12.3
Professional Specialties	6.5	23.4	10.0
Technical, Sales & Admin. Support	19.2	24.9	27.9
Technicians & Technologists	3.7	6.1	6.7
Sales	1.9	0.8	4.2
Admin. Support (incl. Clerical)	13.6	18.0	17.0
Service Occupations	2.1	3.1	3.1
Farming, Forestry & Fishing Occ.	0.0	0.0	0.1
Precision Production, Craft, and Repair Occ.	17.7	22.5	13.6
Mechanics, Repair, Extractive & Construction Trades	5.7	7.5	6.0
Precision Production	12.0	15.0	7.6
Operatives, Fabricators & Laborers	47.4	16.7	33.1
Total	100.0%	100.0%	100.0%

Columns may not sum to 100.0% due to rounding.

Source: U.S. Department of Commerce, Bureau of the Census, Detailed Population Characteristics: Missouri, 1980.

(The occupational distribution for the "high technology" instruments industry in Missouri is not available.)

Table 19

Detailed Occupations with over 1,000 Employees in the "High Technology" Chemicals, Electrical and Electronic Equipment, and Aircraft Industries, Missouri, 1980

Occupation	Number Employed in these Three Industries
Machine Operators & Tenders, exc. Precision	15,805
Assemblers	9,746
Engineers	9,257
Supervisors, Precision Production Occupations	6,215
Managers & Administrators, NEC	4,858
Mechanics & Repairers, exc. Auto	4,573
Secretaries	3,715
Production Inspectors, Testers, Samplers and Weighers	3,449
Sales Representatives, Commodities, exc. Retail	2,073
Laborers, exc. Construction	1,859
Cleaning & Building Service Occupations, exc. Household	1,871
Production Coordinators & Expeditors	1,745
Other Specified Managers (exc. Health, Education & Financial)	1,722
Hand Packers and Packagers	1,588
Material Moving Equipment Operators	1,557
Machinists	1,476
Accountants & Auditors	1,274
Stock & Inventory Clerks	1,237
Administrative Support Occupations Supervisors	1,221
Bookkeepers, Accounting & Auditoring Clerks	1,200
Welders & Cutters	1,198
Technicians, exc. Health, Engineering, and Science	1,180
Electrical and Electronic Technicians	1,072
Electricians	1,048
Chemists, exc. Biochemists	1,038

(These occupations account for 76.4% of total employment in the Chemicals, Electrical and Electronic Equipment and Aircraft Industries in Missouri.)

Source: U.S. Department of Commerce, Bureau of the Census, Detailed Characteristics of the Population: Missouri, 1980.

Table 20

Institutional Delivery System for Vocational Education

State	Comprehensive High Schools	Vocational High Schools	Area Vocational Centers	Area Vocational Schools	Technical Institutes	Community and Junior Colleges	Total
Alabama	15		82		20	25	142
Alaska	2		2			10	14
Arizona	21					22	43
Arkansas	34		9	23		6	72
California	(623)		9			104	736
Colorado	76		7			11	94
Connecticut	35		32		4	12	83
Delaware	(25)		4			4	33
District of Columbia	11	6			1		18
Florida	94		32			28	154
Georgia	120		9	25		3	157
Hawaii	(30)					7	37
Idaho	50			6			56
Illinois	(600)		30			51	681
Indiana	86		38		13		137
Iowa	8			26			34
Kansas	24			14		19	57
Kentucky	4		68	14		13	99
Louisiana	24		15	43		1	83
Maine	22		25		6		53
Maryland	46	5	21			18	90
Massachusetts	42	47				15	104
Michigan	269		42			(34)	345
Minnesota	28		60	33		17	138
Mississippi	(40)		62	28		--	130
Missouri	(200)(358 in 1983)		53(58 in 1983)			16	269(432 in 83)
Montana	(15)			5		3	23
Nebraska	57				14		71

Does not include manpower skill centers, adult and other special schools, mobile facilities, or facilities in penal institutions.

Numbers in parentheses indicate estimates used where exact numbers could not be derived.

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Table 20

Institutional Delivery System for Vocational Education

State	Comprehensive High Schools	Vocational High Schools	Area Vocational Centers	Area Vocational Schools	Technical Institutes	Community and Junior Colleges	Total
Nevada	22			1		3	26
New Hampshire	7		20		7		34
New Jersey	79	37	29			16	161
New Mexico	25			2		6	33
New York	(375)	(31)	72		6	44	528
North Carolina	(245)		6		35	22	308
North Dakota	13		9			5	27
Ohio	(200)	49			17	5	272
Oklahoma	39		31		3	14	87
Oregon	119					23	142
Pennsylvania	(180)	18	79			17	294
Rhode Island			9			2	11
South Carolina	68		55		18		141
South Dakota	19		6	5			30
Tennessee	130		50	30	4	10	224
Texas	(250)		152		4	56	462
Utah	88		6		2	3	99
Vermont			15		1		16
Virginia	106		97			33	236
Washington	43				5	27	75
West Virginia	40		40			3	83
Wisconsin	187		2	34			223
Wyoming	(20)					7	27
American Samoa	4		1			1	6
Guam		1				1	2
Puerto Rico	14			19	2		35
Trust Territory	1			2		1	4
Virgin Islands	3					1	4
Total	4878	194	1279	310	162	719	7543

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National Study of Vocational Education Systems and Facilities. October, 1978.

Table 21

Types of Institutions Offering Vocational Education

Institutional Type	Characteristics	Number
General high school	Usually offers two or three vocational courses, typically in the areas of business and office, agriculture, industrial arts, consumer and homemaking	10,851
Comprehensive high school	A general school offering programs in at least six different vocational subjects (although the majority of students are not enrolled in voc. ed. programs)	4,878
Vocational high school	A specialized secondary school offering a full-time program that combines academic and vocational subjects; all or a majority of the students are enrolled in vocational education programs	225
Area vocational center, secondary	A shared-time facility that provides only vocational education instruction to students from throughout a school system or region; these students study academic courses in their regular high schools or in other institutions	1,395
Area vocational school, postsecondary	A non-degree-granting institution (or an institution offering a degree that is not recognized by the regional accrediting commission for higher education), which offers instruction only in vocational and technical subjects and whose educational programs are terminal	504
Community/Junior college	A two-year, postsecondary, degree-granting institution (that may also award certificates and licenses), which offers a comprehensive instructional program in both general and vocational/technical education and a transfer program to institutions of higher education	720
Technical institute	A two-year, postsecondary, degree-granting institution, which offers instruction primarily in vocational and technical programs that are focused on immediate job placement	162
Specialized postsecondary school	Usually offers specialized preparation in one occupational area	308
Four-year institution offering two-year programs	A four-year college or university offering two-year degree programs in vocational or technical areas	185
Skill center	Usually a separate institution that specializes in providing vocational education to economically disadvantaged students	70
TOTAL		19,298

Bottoms, Gene and Copa, Patricia, "A Perspective on Vocational Education Today," Phi Delta Kappan, January 1983, p. 350.

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Table 22

Higher Education Institutions in Missouri

	Number	Enrollment Fall, 1980	Percent of Total Enrollment
Total Public Schools	28	170,701	75.7%
University of Missouri	4	56,180	24.9%
State 4-yr. Colleges & Universities	9	57,584	25.5%
State 2-yr. Colleges	15	56,937	25.3%
Total Private Schools[1]	30	49,431	21.9%
4-yr. Colleges & Universities	25	48,050	21.3%
2-yr. Colleges	5	1,381	0.6%
Technical & Professional Institutions	9	5,497	2.4%
Total Higher Education	67	225,629	100.0%

[1] Total does not include enrollment for theological schools for which data are not available.

Source: Missouri Department of Higher Education

Table 23

Grouping of Area Vocational Schools by Number of Programs

Size	Number of Programs	Number of Schools in Missouri 1975	1983
Small	0-5	20	0
Medium	6-10	27	8
Large	11-20	7	42
Very Large	21 and Larger	1	8

Table 24

Types and Number of Institutions Offering Vocational Education in Missouri

Institutional Type	Number in Missouri
Comprehensive High School	358
Area Vocational Center (Secondary - Post-secondary)	58
Junior College	15
Four-Year Institution	13
Skill Center	5
Other State Agencies (Dept. of Corrections, Youth Training Programs, etc.)	16
TOTAL	465

Table 25

Labor Market Follow-up of Secondary Vocational Education Graduates by Type and U.S. Department of Education Code, 1981-82 Cohort[a]

O.E. Code[c]	Course	Completions	Employment Related Placements		Not Employed		All Other Productive Activity[d]		Unknown or Not Available[e]	
			#	%[b]	#	%[b]	#	%[b]	#	%[b]
01.0101	AN SCIE	7	1	14.3	0	14.3	6	85.7	0	0.0
01.0102	PL SCIE	18	3	16.7	0	0.0	10	55.6	5	27.8
01.0104	FM MGMT	165	61	37.0	13	7.9	87	52.7	4	2.4
01.0199	LS C PD	168	86	51.2	2	1.2	69	4.1	11	6.5
01.0200	AG SUPP	125	57	45.6	7	5.6	55	44.0	6	4.8
01.0301	AG POWE	120	53	44.2	7	5.8	59	45.7	1	0.8
01.0302	AG STRU	92	37	40.2	10	10.9	41	44.6	4	4.3
01.0304	AG SURV	36	12	33.3	3	8.3	17	47.2	4	11.1
01.0306	AG CONS	128	54	42.2	4	3.1	63	49.2	7	5.5
01.0500	OR HORT	34	12	35.3	2	5.9	18	52.9	2	5.9
01.0700	FORESTR	21	2	9.5	1	4.8	15	71.4	3	14.3
01.9900	AG OTHE	5	3	60.0	0	0.0	2	40.0	0	0.0
TOTAL AGRICULTURE		919	381	41.5	49	5.3	442	48.1	47	5.1
04.0000	DIST ED	1,494	587	39.3	114	7.6	666	44.6	127	8.5
TOTAL DISTRIBUTIVE EDUCATION		1,494	587	39.3	114	7.6	666	44.6	127	8.5
07.0000	HEALTH	8	6	75.0	0	0.0	2	25.0	0	0.0
07.0399	OT NURS	9	3	33.3	0	0.0	6	66.7	0	0.0
07.0906	HL SV AI	250	51	20.4	39	15.6	115	46.0	45	18.0
TOTAL HEALTH		267	60	22.5	39	14.6	123	46.1	45	16.9
09.0201	CHIL CA	95	13	13.7	4	4.2	43	45.3	35	36.8
09.0202	CL MGMT	15	3	20.0	2	13.3	7	46.7	3	20.0
09.0203	FD MGMT	173	60	34.7	26	15.0	68	39.3	19	11.0
09.0204	HO FURN	8	1	12.5	1	12.5	6	75.0	0	0.0
09.0205	HO MGMT	4	1	25.0	1	25.0	2	50.0	0	0.0
09.0299	OCC OTH	3	0	0.0	2	66.7	0	0.0	1	33.3
TOTAL CON & HOME ECONOMICS		298	78	26.2	36	12.1	126	42.3	58	19.5
14.0000	BUS OFF	33	9	27.3	1	3.0	14	42.4	9	27.3
14.0100	ACCOUNT	143	12	8.4	6	4.2	115	80.4	10	7.0
14.0201	COMPUTE	16	0	0.0	0	0.0	16	100.0	0	0.0
14.0202	KEY PUN	123	17	13.8	7	5.7	81	65.9	18	14.6
14.0203	PROGRAM	33	2	6.1	2	6.1	26	78.8	3	9.1
14.0300	CLERICA	987	257	26.0	94	9.5	519	42.5	117	11.9
14.0700	SECRETA	269	85	31.6	17	6.3	146	54.3	21	7.8
TOTAL BUSINESS AND OFFICE EDUCATION		1,604	382	23.8	127	7.9	917	57.2	178	11.1

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Table 25 (continued)

O.E. Code[c]	Course	Completions	Employment Related Placements #	Employment Related Placements %[b]	Not Employed #	Not Employed %[b]	All Other Productive Activity #	All Other Productive Activity %[b]	Unknown or Not Available #	Unknown or Not Available %[b]
16.0117	SCIE PR	71	4	5.6	3	4.2	48	67.6	16	22.5
TOTAL DATA PROCESSING		71	4	5.6	3	4.2	48	67.6	16	22.5
17.0000	INDU ED	469	226	48.2	33	7.0	163	34.8	47	10.0
17.0100	AIR CON	46	10	21.7	5	10.9	25	54.3	6	13.0
17.0200	APPL RP	23	3	13.0	5	21.4	11	47.8	4	17.4
17.0301	BOD FEN	178	59	33.1	18	10.1	88	49.4	13	7.3
17.0302	MECHANI	401	89	22.2	20	5.0	237	59.1	55	13.7
17.0399	O AU SV	6	3	50.0	0	0.0	0	0.0	3	50.0
17.0400	AVIA OC	19	1	5.3	0	0.0	14	73.7	4	31.6
17.0700	C ART O	41	4	9.8	4	9.8	26	63.4	7	17.1
17.1001	CARPENT	290	73	25.2	26	9.0	172	59.3	19	6.6
17.1002	ELECTRI	39	2	5.2	2	5.2	30	76.9	5	12.8
17.1004	MASONRY	14	2	14.3	0	0.0	10	71.4	2	14.3
17.1007	PLB PIP	21	3	14.3	4	19.0	7	33.3	7	33.3
17.1099	O CNMT	36	12	33.3	3	8.3	16	44.4	5	13.9
17.1200	DI MECH	23	9	39.1	3	13.0	9	39.1	2	8.7
17.1300	DRAF OC	59	4	6.8	2	3.4	39	66.1	14	23.7
17.1500	ETRN OC	147	16	10.9	7	4.8	106	72.1	18	12.2
17.1600	FABR SV	49	5	10.2	6	12.2	19	38.8	19	38.8
17.1900	GHAR OC	127	20	15.7	14	11.0	73	57.5	20	15.7
17.2302	MACH SH	91	21	23.1	9	9.9	45	49.5	16	17.6
17.2305	SHT MET	17	2	11.8	4	23.5	6	35.3	5	29.4
17.2305	WEL CUT	191	50	26.2	21	11.0	80	41.9	40	20.9
17.2399	OT METW	15	4	26.7	1	6.7	9	60.0	1	6.7
17.2602	COSMETO	42	12	28.7	0	0.0	9	21.4	21	50.0
17.2900	QU FD O	47	14	29.8	1	2.1	17	36.1	15	31.9
17.3100	SM ENRP	33	4	12.1	7	21.2	19	57.6	3	9.1
17.3300	TX PR F	26	0	0.0	3	11.5	10	38.5	13	50.0
17.3400	SH MFRP	15	2	13.3	3	20.0	8	53.3	2	13.3
17.3600	WDWKOC	34	8	23.5	4	11.8	14	41.2	8	23.5
17.9900	OTH T-I	64	13	20.3	6	9.4	44	68.8	1	1.6
TOTAL TRADE AND INDUSTRY		2,563	671	26.2	211	8.2	1,306	51.0	375	14.7
TOTAL SECONDARY VOCATIONAL EDUCATION		7,216	2,163	30.0	579	8.0	3,528	48.9	846	11.7

Source: Missouri Department of Elementary and Secondary Education. Research Coordinating Unit. Vocational Education Follow-up. Summary of Follow-up by Type and OE Code 1982. Dated 09/23/83.

Notes: a/ This data set represents a 20 percent sample of the 1981-82 secondary vocational education students who completed their training.

b/ Totals may not add to 100.0 due to rounding error.

c/ See the 1983-87 Missouri State Plan for Vocational Education and Accountability Report for FY 1981, Index D for the exact identification of these occupations.

Table 25 Notes (continued)

d/ This category includes: employment that is not training related; military employment; and continuation of education.

e/ This category includes: information not available and status unknown.

Table 26

Labor Market Follow-up of Post-secondary Vocational Education Graduates by Type and U.S. Department of Education Code, 1981-82 Cohort[a]

O.E. Code	Course	Completions	Employment Related Placements		Not Employed		All Other Productive Activity[c]		Unknown or Not Available[d]	
			#	%[b]	#	%[b]	#	%[b]	#	%[b]
01.0000	AGRICULTURE	71	43	60.6	3	4.2	13	18.3	12	16.9
04.0000	DISTRIBUTIVE EDUCATION	279	118	42.3	14	5.0	67	24.0	80	28.7
07.0000	HEALTH	556	271	48.7	16	2.9	87	15.6	182	32.7
09.0000	CON & HOME ECONOMICS	118	51	43.2	2	1.7	30	25.4	35	29.7
14.0000	BUSINESS & OFFICE EDUCATION	910	352	38.7	49	5.4	233	25.6	276	30.3
16.0000	TECHNICAL SPECIALITIES	492	184	37.4	17	3.5	130	26.4	161	32.7
17.0000	TRADE & INDUSTRY	199	80	40.2	11	5.5	63	31.6	45	22.6
	TOTAL POST-SECONDARY EDUCATION	2,625	1,099	41.9	112	4.3	623	23.7	791	30.1

Source: Missouri Department of Elementary and Secondary Education. Research Coordinating Unit. Vocational Education Follow-up. Summary of Follow-up by Type and OE Code 1982. Dated 09/23/83.

Notes: a/ This data set represents a 20 percent sample of the 1981-82 post-secondary vocational education students who completed their training.

b/ Totals may not add to 100.0 due to rounding error.

c/ This category includes: employment that is not training related; military employment; and continuation of education.

d/ This category includes: information not available and status unknown.

Table 27

Labor Market Follow-up of Secondary Vocational Education Graduates by Type and U.S. Department of Education Code, 1981-82 Cohort[a]

O.E. Code[c]	Course	Completions	Employment Related Placements		Not Employed		All Other Productive Activity[d]		Unknown or Not Available[e]	
			#	%[b]	#	%[b]	#	%[b]	#	%[b]
01.0301	AG POWE	18	15	83.3	3	16.7	0	0.0	0	0.0
TOTAL AGRICULTURE		18	15	83.3	3	16.7	0	0.0	0	0.0
07.0101	DENT AS	47	28	59.6	2	4.3	8	17.0	9	19.1
07.0302	PRC NUR	848	669	78.9	19	2.2	29	3.4	131	19.6
07.0303	NURS AS	3	2	66.7	0	0.0	1	33.3	0	0.0
07.0305	SURG TC	23	20	87.0	0	0.0	2	8.7	1	4.3
07.0903	RES THR	36	30	83.3	0	0.0	0	0.0	6	16.7
07.9900	OT HLTH	18	3	16.7	1	5.6	9	50.0	5	27.8
TOTAL HEALTH		975	752	77.1	22	2.3	49	5.0	152	15.6
09.0203	FD MGMT	12	4	33.3	3	25.0	5	41.7	0	0.0
09.0205	HO MGMT	5	2	40.0	0	0.0	3	60.0	0	0.0
TOTAL CON & HOME ECONOMICS		17	6	35.2	3	17.6	8	47.0	0	0.0
[illegible].0203	PROGRAM	19	4	21.1	8	42.1	4	21.1	3	15.8
14.0700	SECRETA	12	6	50.0	2	16.7	3	25.0	1	8.3
TOTAL BUSINESS AND OFFICE EDUCATION		31	10	32.3	10	32.3	7	22.6	4	12.9
16.0106	CIVI TC	3	2	66.7	0	0.0	1	33.3	0	0.0
16.0108	ETRN TC	55	46	83.6	0	0.0	7	12.7	2	3.6
TOTAL TECHNICAL SPECIALITIES		58	48	82.8	0	0.0	8	13.8	2	3.4
17.0100	AIR CON	61	37	60.7	2	3.3	12	19.7	10	16.4
17.0301	BOD FEN	34	18	52.9	4	11.8	9	26.5	3	8.8
17.0302	MECHANI	94	54	57.4	8	8.5	23	24.5	9	9.6
17.0400	AVIA OC	19	18	94.7	0	0.0	1	5.3	0	0.0
17.1099	O CNMT	59	22	37.3	2	3.5	35	59.3	0	0.0
17.1300	DRAF OC	38	28	73.7	0	0.0	7	18.4	3	7.9
17.1500	ETRN OC	24	4	16.7	6	25.0	7	29.2	7	29.2
17.2200	MARI OC	5	1	20.0	0	0.0	3	60.0	1	20.0
17.2302	MACH SH	39	25	64.1	1	2.6	10	25.6	3	7.7
17.2306	WEL CUT	37	15	40.5	2	5.4	9	24.3	11	29.3
17.2602	COSMETO	36	15	41.7	4	11.1	4	11.1	13	36.1
17.2900	QU FD O	6	5	83.3	0	0.0	1	16.7	0	0.0
17.3600	WD WK OC	6	4	66.7	0	0.0	2	33.3	0	0.0
17.9900	OTH T-I	41	10	24.4	6	14.6	25	61.0	0	0.0
TOTAL TRADE & INDUSTRY		499	256	51.3	35	7.0	148	29.7	60	12.0
TOTAL ADULT EDUCATION		1,598	1,087	68.0	73	4.6	220	13.8	218	13.6

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Table 27 (continued)

Source: Missouri Department of Elementary and Secondary Education. Research Coordinating Unit. Vocational Education Follow-up. Summary of Follow-up by Type and OE Code 1982. Dated 09/23/83.

Notes: a/ This data set represents an 85 percent sample of the 1981-82 Cohort of adult vocational technical education students who completed their training.

b/ Totals may not add to 100.0 due to rounding error.

c/ See the 1983-87 Missouri State Plan for Vocational Education and Accountability Report for FY 1981, Index D for the exact identification of these occupations.

d/ This category includes: employment that is not training related; military employment; and continuation of education.

e/ This category includes: information not available and status unknown.

Table 28

Comparison of Placement Performance with Relative Expenditures: Secondary Vocational Education, 1982

Program Area[a/]	Total State Local & Federal Expenditures (in dollars)	Percent of Total Expenditures	Total Placed in Job Related Training	Percent of Total Placement	Total Unemployment	Percent of Total Unemployment
AGRICULTURE	6,200,582	14.4	381	17.6	50	8.7
DISTRIBUTIVE	2,765,604	6.4	587	27.2	114	19.8
HEALTH	1,132,100	2.6	60	2.8	39	6.7
CON & OCC HOME ECONOMICS	11,596,370	27.0	78	3.6	36	6.2
BUSINESS & OFFICE	6,270,832	14.6	382	17.7	127	22.0
TRADE & INDUSTRY	15,063,642	35.0	671	31.1	211	36.6
TOTAL	43,029,130	100.0	2,159	100.0	577	100.0

Source: Table 25 and The Missouri Advisory Council on Vocational Education. "Recommendations and Rationale."

a/ Data processing has been omitted from this table.

Table 29

Comparison of Placement Performance with Relative Expenditures: Post-secondary Vocational Education, 1982

Program Area	Total State Local & Federal Expenditures (in dollars)	Percent of Total Expenditures	Total Placed in Job Related Training	Percent of Total Placement	Total Unemployment	Percent of Total Unemployment
AGRICULTURE	624,864	5.0	43	3.9	3	2.7
DISTRIBUTIVE	857,171	6.8	118	10.7	14	12.5
HEALTH	3,497,880	27.9	271	24.7	16	14.3
OCC HOME ECONOMICS	613,978	4.9	51	4.6	2	1.8
BUSINESS & OFFICE	2,554,167	20.4	352	32.0	49	43.8
TRADE & INDUSTRY[a/]	4,387,030	35.0	264	24.0	28	25.0
TOTAL	12,535,090	100.0	1,099	99.9	112	100.1

Source: Table 26 and The Missouri Council on Vocational Education. "Recommendations and Rationale."

[a/] This program area is the sum of Total Technical Specialities and Total Trade and Industry from Table

Table 30

FY 84 Labor Demand and Supply Summary

Occupational Cluster	Average Annual Openings Net Demand 1/	Total Supply Completions 2/	Total Demand Minus Total Supply (Surplus)	Percent Shortage or (Surplus)
Agriculture Production	2,440	1,734	706	28.9
Agriculture Business	1,009	375*	634	57.7
Agriculture Mechanics	309	2,305*	(1,996)	(646.0)
Horticulture & Landscaping	642	256	386	60.1
Forestry, Logging & Lumber	162	58*	104	64.2
Medical Records Technician	29	54*	(25)	(86.2)
Dental Assistant	250	419 @	(169)	(67.6)
Dental Hygienist	57	92*	(35)	(61.4)
Dental Lab Technician	44	22*	22	50.0
Medical Lab Technician	278	243	35	12.6
Licensed Practical Nurse	845	1,040*	(195)	(23.1)
Medical - Nursing Assistant	1,217	1,709 @	(492)	(40.4)
Human Health Services	782	1,011	(229)	(29.3)
Treatment Service	337	289	48	14.2
Radiologic Technician	124	167 @	(43)	(34.7)
Registered Nurse	1,252	1,981	(729)	(58.2)
Electric Occupations	964	418	546	56.6
Electronic Occupations	868	1,365	(497)	(57.3)
Civil Technology	57	37	20	35.1
Chemical Technology	46	23*	23	50.0
Sanitation and Public Health	213	181 @	32	15.0
Industrial Technology	15	276 @	(261)	(1,740.0)
Mechanical Technology	9	87	(78)	(866.7)
Jewelry & Watch-Making	53	35	18	34.0
Air Conditioning & Refrigeration	399	879	(480)	(120.3)
Textile Technology & Leatherworking	1,974	413	1,561	79.1
Food Production, Management & Services	6,731	2,644	4,087	60.7
Commercial Aviation	405	536 @	(131)	(32.3)
Brick & Stonemasons	108	115	(7)	(6.5)
Carpentry & Other Construction Trades	2,829	2,338	491	17.4
Plumbers & Pipefitters	509	39	470	92.3
Heavy Equipment Mechanics & Operators	1,578	740 @	839	53.2
Automotive Mechanics	832	2,358	(1,526)	(183.4)

Table 30 (continued)

Occupational Cluster	Average Annual Openings Net Demand[1/]	Total Supply Completions[2/]	Total Demand Minus Total Supply (Surplus)	Percent Shortage or (Surplus)
Mechanics, Except Automotive	192	384	(192)	(100.0)
Automobile Body Repair	136	937	(801)	(589.0)
Drafting	331	708	(377)	(114.0)
Printing & Graphic Arts	879	805	74	8.4
Wood Working	309	110*	199	64.4
Machinists - Tool & Die Makers	1,020	788	232	22.7
Sheet Metal Occupations	396	139*	257	64.9
Welding Occupations	570	1,562	(992)	(174.0)
Other Metal Working Occupations	422	76*	346	82.0
Emergency Medical Tech	99	28	71	71.7
Police Science	1,725	329	1,396	80.9
Fire & Fire Safety	99	58*	41	41.4
Advertising	246	208*	38	15.4
Recreation & Tourism	228	193	35	15.4
Real Estate Marketing	1,263	7,716@	(6,453)	(510.9)
Insurance Marketing	709	34*	675	95.2
Marketing	9,731	5,962	3,769	38.7
Vehicle Operator	2,159	1,076@	1,083	50.2
Custodial Services	4,004	165@	3,839	95.9
Barbering	187	72@	115	61.5
Cosmetology	409	1,909@	(1,500)	(366.7)
Child Care Services	1,725	354*	1,371	79.4
Mortuary Services	73	20*	53	72.6
Hotel-Institution Services	1,307	173*	1,134	86.8
Key Punch Operators	- 108	743	(851)	(a)
Computer Operator	158	250*	(92)	(58.2)
Computer Science	340	1,891	(1,551)	(456.2)
Bookkeeping & Accounting	3,555	2,711	844	23.7
General Typing	7,887	6,788	1,099	13.9
Communications Occupations	1,232	83	1,149	93.3
Secretary - Steno	5,568	3,208	2,360	42.4
Office Administration & Management	1,167	418	749	64.2
Inventory Support Occupations	1,034	18*	1,016	98.3

Source: 1984 Missouri State Plan for Vocational Education and Accountability Report for FY 1982. Appendix A. FY 84 Labor Demand and Supply Summary

Notes:
* = No proprietary completions in this skill.
@ = Over 50% of completions are proprietary.
(a) = Cannot be calculated.
1/ = Total net demand is composed of Current Employment minus Projected Employment.
2/ = Total supply is composed of completions from public vocational, proprietary, and CETA and Job Corps training programs.

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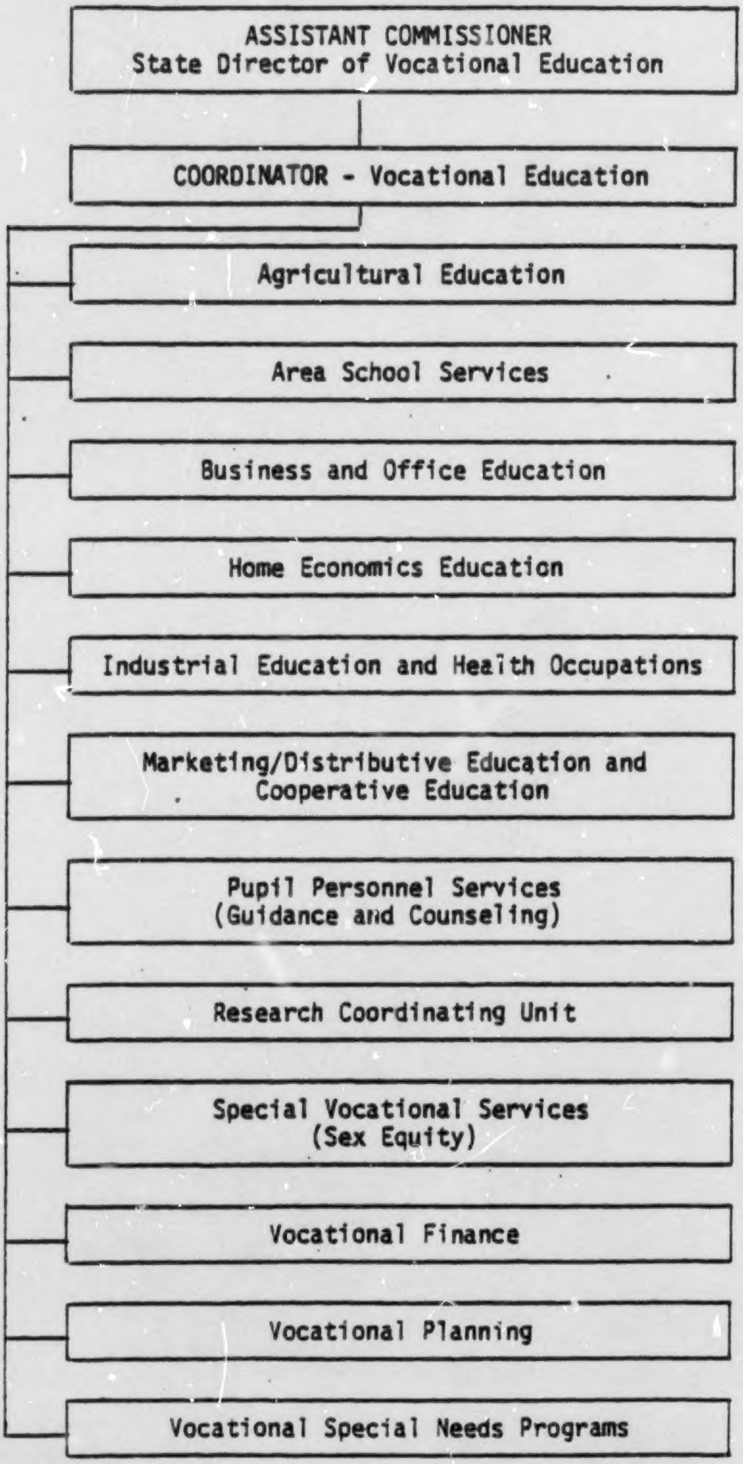
APPENDICES

APPENDIX I

DIVISION OF CAREER AND ADULT EDUCATION ORGANIZATION CHART

DIVISION OF CAREER AND ADULT EDUCATION
VOCATIONAL BRANCH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State Director of Vocational Education
COORDINATOR - Vocational Education
Agricultural Education
Area School Services
Business and Office Education
Home Economics Education
Industrial Education and Health Occupations
Marketing/Distributive Education and Cooperative Education
Pupil Personnel Services (Guidance and Counseling)
Research Coordinating Unit
Special Vocational Services (Sex Equity)
Vocational Finance
Vocational Planning
Vocational Special Needs Programs

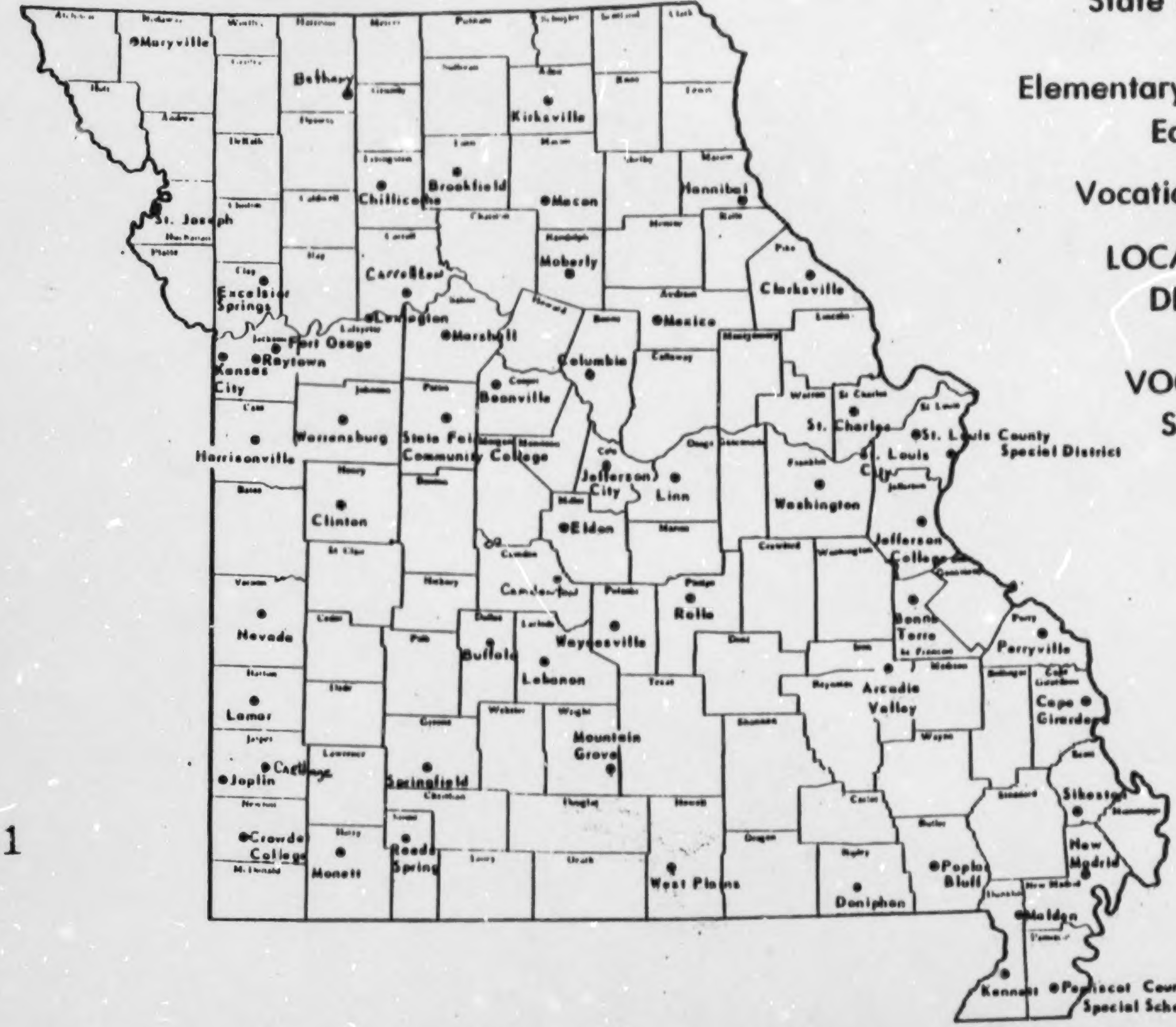
APPENDIX II

LOCATIONS OF DESIGNATED AREA VOCATIONAL SCHOOLS

MISSOURI
State Department
of
Elementary and Secondary
Education

Vocational Division

LOCATIONS OF
DESIGNATED
AREA
VOCATIONAL
SCHOOLS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Kirksville
Brookfield
Chillicothe
Macon
Hannibal
St. Joseph
Moberly
Clarksville
Carrollton
Excelsior Springs
Lexington
Marshall
Mexico
Fort Osage
Raytown
Kansas City
Columbia
Boonville
St. Charles
St. Louis County Special District
St. Louis City
Warrensburg
State Fair Community College
Harrisonville
Jefferson City
Linn
Washington
Clinton
Eldon
Jefferson College
Camdenton
Rolla
Nevada
Bonne Terre
Perryville
Buffalo
Waynesville
Lebanon
Arcadia Valley
Lamar
Cape Girardeau
Mountain Grove
Carthage
Joplin
Springfield
Sikeston
Crowder College
Reeds Spring
Monett
West Plains
New Madrid
Poplar Bluff
Doniphan
Malden
Kennett
Pemiscot County Special School District

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APPENDIX III

SCOPE STATEMENTS (6 AREAS)

Program Subpart: Basic Grant
Category: Regular Programs - Agriculture

SCOPE: Secondary instructional programs in agriculture are four-year programs, year-round in nature. Courses are sequential, with the first two years consisting of basic instruction in Animal Science and Plant Science. The third and fourth years consist of advanced semester units of occupation-specific instruction. Programs include instruction in Agricultural Mechanics, supervised occupational experience (SOE), and career and leadership training. Some two-year specialized training programs are offered in the areas of Horticulture, Conservation, and Agricultural Mechanics. These programs include instruction in supervised occupational experience (SOE) and career and leadership training through the Future Farmers of America (FFA) student organization.

All postsecondary agriculture programs are two-year programs which use an internship program for each student and are designed for a placement objective. Leadership training is being offered through the Missouri Postsecondary Agriculture Student Organization.

Adult instruction in agriculture is both preparatory and supplementary in nature. A two-year adult preparatory program is being offered to prepare students for employment in the farm equipment industry. Adult farmers or agribusiness persons are provided supplementary training to increase their efficiency in production agriculture or their effectiveness in their agricultural business. Many of these adults receive leadership training through their participation in the Young Farmers/Young Farm Wives Associations.

FY 83 STATUS

	No. of Locations	Est. Enrollment	FY 84 Projected Enrollment
Secondary	239 districts	14,474	14,400
Postsecondary	12 campuses	575	610
Adult	130 schools	5,000	5,100

Secondary vocational agriculture programs are currently operating in 239 local public school districts, with 12,020 students enrolled in comprehensive high schools and 2,454 in area vocational schools. Postsecondary programs have 575 enrollees distributed among ten community college campuses, 1 four-year college, and one university. Adult instruction is being provided to 5,000 persons in 130 schools, largely through the efforts of the Young Farmers and Young Farm Wives Associations. Projected secondary and postsecondary enrollments are made from data collected and maintained in the Agricultural Education Section, and are based on an unduplicated student count.

Program Subpart: Basic Grant
Category: Regular Programs - Business and Office Education

SCOPE: Secondary instructional programs in business and office education are designed so that students take two introductory business courses prior to enrolling in a block-time course at the senior level. Most postsecondary business and office education programs are two-year offerings; however, there are a few one-year certificate training programs. Adult instruction in business and office education is both preparatory and supplementary in nature. Increased attention has been given to programs for adults and out-of-school youths during the past several years. Exemplary and flexible training opportunities have been developed such as open-entry/open-exit programs, school-business joint educational programs, in-service programs in companies for employees, programs relating to word and data processing, et cetera.

FY 83 STATUS

	No. of Locations	Est. Enrollment	FY 84 Projected Enrollment
Secondary	264 districts	11,746	11,511
Postsecondary	18 campuses	10,750	11,073
Adult	64 districts	11,560	12,138

Business and office education training programs have been established in 264 of the 456 school districts that maintain high schools. Approximately 60 local high school districts send students to area vocational schools where they acquire saleable skills for entry-level business and office positions. With the increased variety of training programs provided by local educational agencies and the added emphasis of placing young women in nontraditional occupations, the number of secondary enrollees in business and office education training programs has decreased over the past few years. Young men have not been attracted to the clerical-secretarial secondary training programs primarily because of entry-level salaries. However, enrollment figures indicate a significant increase of male trainees in the data processing offerings and with the excellent job opportunities available in this field further enrollment growth is anticipated.

Program Subpart: Basic Grant
Category: Regular Programs - Health Occupations Education

SCOPE: Health Occupations Education serves secondary, postsecondary and adult students enrolled in comprehensive high schools, area vocational-technical schools, community/junior colleges, and selected four-year institutions. Secondary students acquire entry (aide) skills, related knowledge and leadership abilities in one or more health occupations, e.g., nurse assistant (acute and long-term care), radiology aide, medical laboratory aide, et cetera. Postsecondary programs of study include one- and two-year programs in nursing (LPN, Associate Degree Nursing), and Allied Health Occupations for which students receive credit hours toward a certificate or an associate degree. Adult programs include short- and long-term preparatory programs generally not exceeding one calendar year, as well as supplementary programs to upgrade and expand the competencies of nursing and Allied Health personnel. One-year certificate programs include practical nursing, dental assisting, respiratory therapy, et cetera. Short-term preparatory programs train students as nurse assistants (long-term care and acute care), emergency medical technicians, medication technicians, et cetera.

FY 83 STATUS

	No. of Locations	Est. Enrollment	FY 84 Projected Enrollment
Secondary	62 districts	1,492	1,364
Postsecondary	15 campuses	3,523	3,631
Adult	47 districts	11,594	11,819

The Secondary Health Services Assistant programs are currently operated in 62 public school districts. There are an estimated 1,492 students enrolled in comprehensive high schools, and the postsecondary programs have an estimated enrollment of 3,523 distributed among 10 community/junior college districts and five four-year institutions and universities. Adult preparatory and supplementary instruction is being provided to an estimated 11,594 persons in 47 districts which included all agencies previously listed. Increases in enrollments are predicated upon the available resources to generate new and expanding programs, as well as the accessibility of student financial aids.

Program Subpart: Basic Grant
Category: Regular Programs - Wage-Earning Home Economics

SCOPE: Vocational wage earning home economics programs are groups of instructional programs that emphasize the acquisition of competencies (including skills and job attitudes) needed for securing and holding paid employment at the entry and advanced levels, and/or preparing for advancement in occupations utilizing home economics education knowledge and skills. Vocational home economics education instructional programs are developed from home economics education subject matter areas to meet the unique requirements of the specific vocations. Programs that prepare individuals for paid employment include: (1) services to individuals/families; (2) assistance to professional home economists and professionals in fields related to home economics in industry, business, and public and private agencies; and (3) other services and/or assistance directly related to one or more of the home economics subject matter areas, offered in formal and/or informal settings combined with supervised laboratory and work experiences offered at the secondary, postsecondary, and adult levels.

Wage earning home economics clusters relate to the following areas: child care and guidance, management and services; clothing apparel and textiles, management, production and services; food production, management and services; home furnishings and equipment, management, production and services; institutional/home management and supporting services; other, human services and consumer services.

FY 83 STATUS

	No. of Locations	Est. Enrollment	FY 84 Projected Enrollment
Secondary	30 districts	1,526	1,608
Postsecondary	11 campuses	1,700	1,838
Adult	7 districts	800	875

A total of forty-six (46) secondary programs serving an estimated 1,526 students are operating in the comprehensive high schools and area vocational schools during FY 83.

Twenty-one (21) postsecondary programs with an estimated enrollment of 1,700 are being conducted at six community colleges and five state universities. In general, training at the adult level is supplementary in nature. Seven LEAs are participating with an estimated enrollment of 1,400 students.

Program Subpart: Basic Grant
Category: Regular Programs - Industrial Education

SCOPE: Industrial Education programs prepare students at various levels for employment in occupations which require a high degree of skill development, related knowledge and leadership abilities. Secondary programs, for the most part, require two full years of instruction within three consecutive class periods per day in order to adequately prepare students for competition in the job market. Junior and senior students who have declared a specific occupational intent are enrolled in secondary level programs in both comprehensive high schools and area vocational schools. Postsecondary programs are operated in junior colleges and four-year institutions which consist of a variety of courses leading to a major in an occupational area. Courses are generally oriented toward lab/practicum activities and experiences requisite for high level skill development. While postsecondary students may, with required general education courses, pursue an associate degree, programs beyond the secondary level are one- or two-year certificate programs. Adult preparatory programs are operated in area vocational schools. These programs are strongly oriented toward lab/practicum activities and experiences leading to employment in occupational areas. Specific programs are developed at the adult level to assist industry throughout the state in high-technology areas. In addition, adult supplemental training is also provided to upgrade the skills of, or introduce new technology to persons already employed. Pre-apprenticeship and apprenticeship instruction are in operation in a number of industrial areas, and are included in the category of Industrial Education programs.

	FY 83 STATUS		
	No. of Locations	Est. Enrollment	FY 84 Projected enrollment
Secondary	132 districts	17,468	15,574
Postsecondary	14 campuses	7,626	6,700
Adult	51 districts	23,543	27,089

The enrollment projections for 1984 were determined by utilizing data from school surveys of projected enrollment, Missouri school and population data (past, present and projected), evaluation information, and economic and labor market trends. Based on these factors, it is anticipated that secondary vocational enrollments will continue to decline; however, this decline is not expected in all programs. An additional factor contributing to a lower projected enrollment is the shift from Industrial Education to other program areas of some programs, e.g., data processing and quantity foods.

Program Subpart: Basic Grant
Category: Industrial Arts

SCOPE: The basic element of the Industrial Arts program is the study of industry and its associated technology. As formally organized in the school program, it is a body of subject matter planned to develop skills, understandings, and attitudes related to industry and technology. While Industrial Arts is a phase of general education, it also significantly contributes to career and occupational awareness and interests of individuals. Occupationally Oriented Industrial Arts programs focus on assisting individuals in the making of informed and meaningful occupational choices as well as familiarizing these individuals with, while preparing them for, advanced vocational-technical training programs.

The basic objectives of Industrial Arts education are to:

develop an insight and understanding of tools, machines, materials, and processes as they relate to the production and servicing aspects of industry;

discover and develop abilities, aptitudes, and interests related to the technical pursuits and applied sciences;

develop basic skills in the safe and proper use of industrial materials, tools, machines and processes;

develop problem-solving and creative abilities relating to the tools, machines, materials, process and products of industry; and

develop an understanding of industrial and technological career opportunities and their requirements and develop those traits which will help obtain and maintain employment.

FY 83 STATUS

	Number of Schools	Teachers	Enrollment
Elementary		17	902
Junior High		339	42,630
Secondary	409	806	76,797
TOTAL	409	1,162	120,329

Program Subpart: Basic Grant
Category: Regular Programs - Marketing/Distributive Education

SCOPE: Marketing/distributive education is a vocational instructional program designed to meet the needs of persons who have entered or are preparing to enter a marketing and/or distributive occupation or an occupation requiring competency in one or more of the marketing functions. Specifically, marketing/distributive education offers instruction in marketing, merchandising, and management with the primary goal of preparing individuals for entry, adjustment, and advancement in marketing and distributive occupations. The preparation may be in secondary, postsecondary, or adult level programs which may be conducted in comprehensive high schools, area vocational schools, or community/junior colleges.

FY 83 STATUS

	No. of Locations	Est. Enrollment	FY 84 Projected Enrollment
Secondary	141 districts	9,725	*9,700
Postsecondary	10 campuses	2,753	3,000
Adult	15 districts	1,108	1,350

A total of 182 marketing/distributive education training programs are currently operating in 141 school districts, with 9,725 secondary students enrolled. Fifteen (15) postsecondary programs are currently operating in ten community college districts with a total enrollment of 2,753. Adult instruction is being provided to 1,108 persons in fifteen (15) secondary and community college districts.

*Projected FY 84 enrollments for secondary students reflect decreasing numbers of students to be served as compared with previous years. The declining secondary student population and early release programs indicate that fewer secondary students will be enrolling in marketing/distributive education programs.

APPENDIX IV

PROGRAM OFFERINGS/AREA VOCATIONAL SCHOOLS

Vocational and Occupational Programs Offered in Missouri Area Vocational Schools

1. Accounting
2. Advanced Ag. Structures
3. Aero Mechanics
4. Agriculture
5. Agri Business
6. Agri Equipment Tech.
7. Agri Mechanics
8. Agri Power & Machinery
9. Air Conditioning/Refrig.
10. Aircraft Electronic Tech.
11. Airframe & Power Mechanics
12. Animal Science
13. Appliance Repair
14. Architectural Drafting
15. Auto Body Repair
16. Auto Diagnostics
17. Automotive Mechanics
18. Automotive Services
19. Automotive Technology
20. Building Maintenance
21. Building Trades
22. Business & Office Education Specialties
23. Business Management
24. Business & Office Edu.
25. Cabinet Making
26. Child Care
27. Civil Engineering Tech.
28. Clerical
29. Clerk Typist
30. Clothing & Textiles
31. Cooperative Industrial
32. Cooperative Occupational Edu.
33. Commercial Art
34. Commercial Building Services
35. Commercial Cooking
36. Communication Tech.
37. Comprehensive Homemaking
38. Computer Programming
39. Conservation
40. Constr. & Maintenance Trades
41. Cosmetology
42. Culinary Arts
43. Data Processing
44. Dental Assistant
45. Diesel Mechanic
46. Drafting
47. Dressmaking
48. Electrical Trades/Electricity
49. Electronics
50. Emergency Medical Tech.
51. Farm Business Management
52. Farm Equipment Repair
53. Fire Science
54. Food Management & Service
55. Graphic Arts
56. Health Services Aide
57. Heavy Equipment Repair
58. Home Management
59. Horticulture
60. Hotel-Motel-Restaurant
61. Housing & Interior Design
62. Industrial Foremanship
63. Industrial Plant Maintenance
64. Industrial Sewing
65. Key Punch
66. Laundry & Dry Cleaning
67. Law Enforcement
68. Machine Shop
69. Machine Trades
70. Marina Repairs
71. Marketing & Distributive Edu.
72. Masonry
73. Mechanical Technology
74. Medical Office Asst.
75. Medication Technician
76. Merchandise & Sales Management
77. Metal Trades
78. Nurse Aide
79. Nursing (Associate Degree)
80. Nursing Home In-Service
81. Nursing (Practical)
82. Office Machines Sales & Servi
83. Operating Room Tech.
84. Plumbing
85. Radio Broadcasting
86. Radio-TV Sales & Service
87. Respiratory Therapy
88. Sales Marketing/Retail
89. Secretarial
90. Sheet Metal
91. Small Engine Repair
92. Soil/Plant Service
93. Tailoring
94. Tourism & Recreation
95. Vocational Crafts
96. Welding
97. Woodworking
98. Word Processing

Vocational and Occupational Programs Offered by Missouri Area Vocational Schools

Location	*School*	*Programs Offered* *(Numbers correspond to programs listed above)*
Bethany	North Central Area Vocational Technical School	4, 15, 17, 21, 28, 49, 52, 56, 71, 96
Bonne Terre	Lead Belt Area Vocational Technical School	9, 15, 17, 21, 28, 43, 48, 49, 55, 56, 68, 89, 91, 96
Boonville	Boonslick Area Vocational Technical School	4, 15, 17, 21, 28, 49, 56, 63, 71, 81, 89
Brookfield	Brookfield Area Vocational Technical School	1, 17, 21, 28, 46, 71, 89
Camdenton	Lake Area Vocational Technical School	9, 15, 17, 20, 21, 28, 43, 54, 56, 63, 68, 70, 71, 72, 89, 91, 94
Cape Girardeau	Cape Girardeau Area Vocational Technical School	9, 15, 17, 28, 32, 43, 46, 49, 54, 55, 56, 59, 71, 81, 89, 96
Carrollton	Carrollton Area Vocational Technical School	4, 15, 17, 21, 28, 43, 55, 56, 71, 89, 96
Carthage	Carthage Area Vocational Technical School	4, 17, 21, 28, 49, 56, 68, 71
Chillicothe	Chillicothe Area Vocational Technical School	1, 4, 8, 9, 15, 17, 21, 28, 46, 49, 56, 71, 78, 89, 96
Clinton	Clinton Area Vocational Technical School	4, 9, 17, 21, 22, 56, 68, 71, 72, 75
Columbia	Columbia Area Career Center	26, 28, 30, 31, 43, 45, 49, 54, 56, 59, 71, 81, 82, 83, 89, 96
Doniphan	Current River Area Vocational Technical School	4, 17, 21, 28, 43, 48, 56, 72, 89, 91, 96
Eldon	Tri-County Technical School	1, 4, 15, 17, 20, 27, 28, 40, 46, 49, 55, 56, 70, 71, 89
Eolia	Pike and Lincoln Counties Area Vocational School	9, 15, 17, 18, 21, 26, 28, 56, 73, 81, 96
Excelsior Springs	Excelsior Springs Area Vocational Technical School	9, 17, 21, 28, 31, 46, 49, 56, 71, 75, 89
Hannibal	Hannibal Area Vocational Technical School	1, 4, 17, 21, 28, 43, 46, 49, 55, 56, 68, 70, 71, 81, 89, 96
Harrisonville	Cass County Area Vocational School	4, 15, 17, 18, 21, 22, 31, 49, 56, 71, 75, 91, 96
Hillsboro	Jefferson College	1, 9, 12, 14, 19, 21, 23, 29, 49, 50, 53, 60, 62, 67, 68, 71 75, 78, 79, 81, 82, 86, 89, 90, 96, 98
Independence	Fort Osage Area Vocational Technical School	15, 17, 21, 28, 34, 43, 45, 46, 49, 55, 56, 71, 75, 89, 91, 96
Ironton	Arcadia Valley Area Vocational Technical School	15, 17, 21, 28, 55, 56, 89, 96
Jefferson City	Nichols Career Center	9, 15, 17, 21, 22, 28, 31, 33, 40, 43, 44, 49, 55, 59, 65, 71, 73, 81, 89, 96
Joplin	Franklin Technical School	9, 15, 17, 21, 25, 46, 49, 54, 55, 68, 71, 78, 81, 90, 96
Kansas City	Kansas City Technical Education Center	9, 13, 15, 17, 26, 28, 33, 41, 42, 43, 45, 46, 47, 48, 49, 55, 56, 64, 66, 68, 75, 81, 83, 89, 93, 96

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Vocational and Occupational Programs Offered by Missouri Area Vocational Schools (Cont.)

Location	*School*	*Programs Offered*
Kennett	Kennett Area Vocational Technical School	9, 15, 17, 21, 28, 49, 55, 56, 71, 81, 89
Kirksville	Kirksville Area Vocational Technical School	4, 9, 15, 17, 20, 21, 26, 28, 43, 46, 48, 49, 55, 71, 75, 77, 81, 84, 89
Lamar	Lamar Area Vocational Technical School	1, 9, 17, 21, 28, 49, 56, 68, 71, 89, 96
Lebanon	Laclede Area Vocational Technical School	4, 9, 15, 17, 21, 28, 31, 46, 56, 64, 68, 71, 89
Lexington	Lexington La-Ray Area Vocational Technical School	4, 10, 15, 17, 21, 28, 49, 56, 68, 69, 71, 75, 89, 96
Linn	Linn Technical College	1, 9, 10, 11, 15, 19, 46, 49, 57, 69
Louisburg	Dallas County Area Vocational Technical School	9, 15, 17, 21, 28, 49, 55, 56, 85, 96
Macon	Macon Area Vocational Technical School	1, 4, 9, 17, 21, 26, 28, 48, 54, 56, 71, 75, 89, 96
Marshall	Marshall Area Vocational Technical School	2, 4, 9, 17, 21, 28, 31, 48, 49, 56, 71, 75, 81
Maryville	Northwest Missouri Area Vocational Technical School	4, 15, 17, 21, 28, 49, 54, 56, 71, 96
Mexico	Mexico Area Vocational Technical School	1, 8, 9, 15, 17, 21, 26, 28, 30, 32, 41, 43, 46, 49, 56, 61, 68, 71, 75, 78, 81, 96
Moberly	Moberly Area Vocational Technical School	1, 4, 15, 17, 21, 28, 31, 34, 49, 71, 77, 89, 96
Monett	Monett Area Vocational Technical School	15, 17, 21, 22, 25, 28, 31, 46, 49, 54, 55, 56, 68, 72, 89, 91, 96
Mountain Grove	Mountain Grove Area Vocational Technical School	1, 4, 15, 17, 21, 28, 30, 49, 58, 71, 73, 89, 96
Neosho	Crowder College	1, 5, 6, 9, 15, 17, 19, 21, 28, 46, 49, 51, 54, 55, 56, 68, 72, 81, 89, 96
Nevada	Nevada Area Vocational Technical School	4, 7, 9, 15, 17, 20, 21, 28, 49, 56, 71, 82, 81, 89
New Madrid	New Madrid Vocational Technical Skills Center	1, 4, 7, 9, 15, 17, 21, 28, 30, 43, 49, 54, 55, 56, 68, 75, 89, 96
Perryville	Perryville Area Vocational Technical School	4, 15, 17, 21, 28, 49, 55, 56, 71, 75, 78, 89, 91, 96
Platte City	Platte County Area Vocational Technical School	9, 21, 22, 28, 36, 43, 45, 49, 56, 60, 96
Poplar Bluff	Poplar Bluff Area Vocational Technical School	9, 15, 17, 21, 49, 54, 55, 56, 71, 81, 96
Raytown	Joe Herndon Area Vocational Technical School	9, 15, 17, 21, 22, 28, 33, 41, 43, 45, 46, 49, 54, 55, 56, 65, 70, 78, 89, 91, 96
Reeds Spring	Reeds Spring Area Vocational Technical School	4, 15, 17, 21, 28, 31, 49, 54, 55, 70, 89, 91, 95, 96
Rolla	Rolla Area Vocational Technical School	1, 4, 9, 15, 17, 21, 25, 28, 31, 44, 46, 49, 56, 68, 71, 72, 75, 81, 89, 96
St. Charles	Lewis and Clark Technical School	9, 15, 17, 21, 43, 46, 49, 56, 65, 75, 91, 96
St. Joseph	N.S. Hillyard Area Vocational Technical School	9, 15, 17, 21, 43, 46, 49, 55, 56, 68, 81, 96
St. Louis	O'Fallon Technical Center	1, 3, 14, 15, 17, 21, 25, 26, 28, 33, 35, 41, 43, 46, 48, 49, 55, 58, 66, 68, 74, 75, 77, 81, 84, 89, 90, 96
St. Louis County	North St. Louis County Technical School	9, 11, 13, 17, 20, 22, 26, 33, 41, 43, 45, 46, 49, 55, 56, 59, 68, 82, 90, 91, 96
St. Louis County	South St. Louis County Technical School	9, 15, 17, 20, 24, 26, 33, 41, 43, 45, 46, 49, 55, 56, 59, 65, 68, 82, 90, 91, 96
Sedalia	State Fair Community College	4, 18, 19, 21, 23, 38, 49, 50, 54, 68, 69, 76, 78, 87, 89, 96, 98
Sikeston	Sikeston Area Vocational School	9, 15, 16, 17, 21, 28, 46, 49, 50, 55, 56, 68, 71, 75, 80, 81, 83, 89, 96
Springfield	W.J. Graff Vocational Technical Center	4, 9, 13, 15, 17, 33, 38, 39, 43, 44, 45, 46, 48, 49, 54, 55, 56, 59, 62, 68, 71, 73, 75, 76, 81, 83, 84, 87, 89, 90, 96, 97
Warrensburg	Warrensburg Area Vocational Technical School	4, 15, 17, 21, 28, 41, 56, 71, 75, 81, 89, 96
Washington	Four Rivers Area Vocational Technical School	4, 9, 15, 17, 21, 28, 31, 55, 56, 68, 71, 81, 89, 96
Waynesville	Waynesville Area Vocational Technical School	9, 15, 17, 21, 28, 43, 46, 48, 49, 55, 56, 71, 75, 81, 89, 96
West Plains	South Central Area Vocational Technical School	4, 15, 17, 28, 31, 46, 49, 56, 71, 72, 75, 78, 81, 89, 91

APPENDIX V

UNDUPLICATED ENROLLMENT SUMMARY

Type of Institution	Sex Male	Female	Black	Race White	Other	Disadvantaged	Handicapped
Area Vocational School	57,264	33,695	13,475	75,946	1,538	18,838	5,772
Comprehensive High School	40,949	78,656	15,572	103,173	860	21,249	3,909
Junior College	24,109	36,838	14,976	43,083	2,888	25,997	1,887
Four-Year College	1,712	546	736	1,509	13	999	1,259
TOTAL	125,690	153,127	44,897	228,581	5,339	67,669	12,936

APPENDIX VI

EXPANDING AND NEW PROGRAM APPLICATION

FV 3

DEPARTMENT OF ELEMENTARY AND SECONDARY EDUCATION
Coordinator Vocational Education
P.O. Box 480, Jefferson City, Missouri 65102

Number 0 120 003
5/81

GUIDE FOR SUBMITTING APPLICATIONS FOR EXPANDING AND NEW REGULAR VOCATIONAL PROGRAMS

The following outline constitutes the minimum information necessary to review the appropriateness of an application for an expanding or new regular vocational program. ***Prepare and submit a separate proposal for each program by occupational title.***

Proposals are to be submitted to the State Director of Vocational Education on or before March 1. (Applications for ***Adult*** classes may be submitted as the need arises.) Local districts will be notified concerning the approval or disapproval of program requests. Budgets for approved new or expanding programs would be established at the time the annual budget requests are submitted by the local districts.

I. *GENERAL INFORMATION*

A.* Identify program by occupational title and U.S. Office of Education code number (For postsecondary institutions—state precise name of major or specialization, and degree or certificate, if any, to be awarded upon successful completion of program.) Indicate specific occupational objective.
B.* Indicate how the need for this program was determined: employment opportunities, current and projected trends, on advice of administration or advisory committee, etc. Describe the cooperation with the CETA prime sponsor in the development of this program, if applicable.
C. Give advisory committee members, their occupations, what review the proposal has had, nature of appraisal of outside reviewers, etc., if applicable.
D. Indicate extent of supervision: by whom, amount, frequency, etc. In what department or other unit will the program be administered?
E.* Give the name, location, and description of space to be utilized for this program.
F. State the relations of proposed program to present offerings and to long-range plans of the institution.
G.* Give proposed date for initiating the program.

II. *INSTRUCTIONAL INFORMATION*

A.* State the program objectives in measurable terms.
B.* Include a topical outline of major units or divisions in the vocational course(s).
C. List instructional material, major texts and references to be used.
D. Describe standards of performance or level of proficiency expected at program completion.
E. State the qualifications of the instructor(s) the district intends to employ.

III. *STUDENT INFORMATION*

A.* Describe how students will be selected and the nature of students to be served. Indicate anticipated enrollment.
B. Identify educational guidance and counseling services to be provided.
C. Describe follow-up procedure planned.
D. Explain the participation in youth organizations sponsored by the Vocational Division.

IV. *BUDGET*

A. List major equipment currently available.
B. Outline long range plans for major equipment purchases.
C. Show proposed equipment, teaching aids, and supplies expenditures.
D.* List anticipated salary expenditures.

V. *EVALUATION*

A. Explain the procedures and or methods of evaluation to be used in determining results. Relate these to the program objectives.
B. List instrument(s) to be used.
C. Indicate how results of evaluation are to be utilized.

*Minimum information necessary to review the appropriateness of an adult supplemental or apprenticeship new or expanding industry training or consumer and homemaking program.

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APPENDIX VII

RESULTS OF LOCAL ADVISORY COUNCIL PARTICIPATION

RESULTS OF LOCAL ADVISORY COUNCIL PARTICIPATION

The primary source of information about local advisory committee (LAC) participation is documentation provided by local education agencies (LEAs) in preparation for on-site evaluations of vocational programs. Items in individual program evaluation questionnaires and in our Instrument for Evaluation/Accreditation call for documentation/exhibits of membership lists and recorded minutes of advisory committee meetings. Also, during the team evaluations of programs in area vocational schools and community/junior colleges, agenda time is arranged for interaction between team members and LAC representatives. Effective utilization of advisory committees is an area of emphasis in all vocational evaluations as indicated in the summary of evaluations included in the Accountability Report for FY 82. Evaluation reports, however, by design are oriented more toward concerns regarding the make-up and the function of LACs than toward identifying "results" of LAC activities.

Typically, LEAs in Missouri establish advisory committees for individual programs or for program areas. Exhibited materials at evaluations and discussions with local advisory committee representatives reveal that assistance is provided to LEA programs in a number of ways. In addition to curriculum review activities and assistance with placement of vocational graduates, LACs provide assistance and advice on equipment acquisition, facility renovation/modification, and vocational program planning and budgeting. It has been found also that LACs have effectively served in a public relations role and have aided in identifying local resources to support local vocational instruction.

In addition to vocational instruction programs, LACs have been established for each of the displaced homemaker programs in the state. These LACs serve in a more continuous and on-going manner than the committees established to serve regular instructional programs, and have played a major role in program development, client outreach activities, and inter-agency referrals.

Results of LAC input in local vocational programming are found in two primary areas, i.e., new program development and problem-solving for existing programs. Examples of both kinds of results are included in the list that follows. These examples were obtained from evaluation visits occurring this year (FY 83) and from on-going contact with local vocational programs.

Following are some examples of results of LAC participation in new program development:

- In response to a suggestion from community representatives that there was potential for a telecommunications program, a community college formed a LAC to pursue the matter. Upon verification of employment need, the LAC provided assistance in program conceptualization/development in terms of overall program direction, development of curriculum and bringing in donations of specialized equipment worth over $100,000. Their efforts have resulted in approval of program implementation in Fall '83.

- A metropolitan school district, interested in exploring the potential for and pursuing the development of specialized "urban agriculture" vocational programs, named a LAC to assist in the endeavor. The results of LAC participation, to date, include development of programs and phased implementation. .

- A new wage-earning child care program has been approved in a suburban comprehensive high school district largely as the result of significant assistance in proposal development from a newly-formed LAC.

Examples of results of LAC participation in a "problem-solving" context include the following:

- An AVS vocational agriculture program was beset by low enrollment, particularly by students from sending districts. Increased student enrollment from sending schools has been realized through direct LAC participation in promotion of the AVS concept and encouragement of sending school student enrollment.

- A LAC was instrumental in securing and reconstructing a used greenhouse for an AVS horticulture program.

- Efforts by a CHS vocational agriculture program LAC in developing plans for a needed facility and communicating the need to local school patrons contributed to passage of a bond issue.

- Several long-term care facilities are located within the service area of an AVS. While the facilities had a need for short-term training e.g., medication technician and nurse aide, coordination of scheduling was a problem to the extent that insufficient enrollment could be generated to offer state-approved training. The AVS formed an ad hoc advisory committee to address the problem. As a result of this committee's activities, mutually agreed upon training schedules have been arranged, with approvable enrollment levels, and the ad hoc committee has been organized into a formal adult short-term health training program advisory committee.

- Three years ago, with the support and assistance of its LAC, an AVS building trades program changed the basic thrust of the curriculum from annually constructing and selling a house to home renovation and energy efficiency, working on houses in the community in which the AVS is located. A problem emerged when renovation and energy efficiency needs within a reasonable distance of the AVS were satisfied to the degree that too little was available to do to maintain a meaningful curriculum. Upon the advice of, and with the assistance of the LAC, the program was transitioned back to a house construction mode whereby one house is constructed over a 2-year period and students are involved in every aspect of the construction, i.e., such aspects as plumbing, electrical, heating, et cetera, are not sub-contracted unless with the understanding that students will participate. LAC input served as a catalyst in the local board's decision to approve the modification in training approach.

APPENDIX VIII

PROGRAM TERMINATION GUIDELINES

PROGRAM TERMINATION

Following a review of program objectives and results, local agencies or DESE may decide that a program should be terminated. Should this decision be made, the effective termination date will usually occur at the close of the regular school year. Exceptions to this could occur if a program is not in compliance with state or federal law, and no immediate remedy is provided by a local agency.

The local agency may terminate a vocational education program by submitting a letter of notification to the State Director of Vocational Education.

The DESE may initiate termination procedures for a vocational program when:

1. the need for a program no longer exists;
2. there are inadequate or low enrollments;
3. there are insufficient finances (local, state, federal) to support the instructional activities;
4. instructors are not certified by DESE;
5. similar program or service is available (no further than 20 miles) at an area vocational school;
6. there is a change in district structure, consolidation or reorganization;
7. there is an inadequate number of program completers or an inadequate number of completers who fail to enter occupations for which training has been given;
8. local policies or practices are not in compliance with existing laws and regulations.

The DESE procedures for terminating a vocational education program are:

1. Written notification of possible termination is made by the Division of Career and Adult Education to the local educational institution;
2. An effort is made to resolve the problem(s);
3. If the problem(s) can be resolved, the program will remain active and a letter confirming this fact will be sent to local district officials;
4. If the problem(s) cannot be resolved, a financial agreement will be reached and a date of termination will be established;

5. The final act of termination will be a written notification from the Division of Career and Adult Education indicating that all terminating processes are completed and the vocational program is classified as dropped.

Equipment, instructional aids, and materials which were used in a terminated vocational program must be accounted for if the state or federal government has a continuing interest in them.

APPENDIX IX

VOCATIONAL STUDENT ORGANIZATIONS

VOCATIONAL STUDENT ORGANIZATIONS

Vocational student organizations operate at the local chapter, state association and national organization levels. Districts are encouraged to establish and maintain active chapters. The activities of student organizations are closely related to course content and should become an integral part of the vocational curriculum. Though each organization has established a set of specific national and state objectives, all vocational student organizations have several goals in common. Each organization, through its activities, attempts to further a student participant's vocational development and understanding, leadership development, civic consciousness and responsibility, and social intelligence and awareness.

The following vocational student organizations are currently operational in the state.

Distributive Education Clubs of America (DECA)

DECA chapters are organized as a part of the Marketing and Distributive Education (DE) program. Opportunities are available to high school students (high school DECA) as well as postsecondary Distributive Education majors in the collegiate DECA organization. Students enrolled in Cooperative Occupational Education programs, whose career objectives are related to Distributive Education, are eligible for membership in DECA.

Future Business Leaders of America (FBLA) and Phi Beta Lambda (PBL)

These student organizations are available to high school and postsecondary students enrolled in vocationally approved Business Education courses. PBL is the collegiate counterpart of FBLA.

Future Homemakers of America (FHA) and Home Economics Related Occupations (HERO)

FHA chapters are organized as a part of the secondary Consumer and Homemaking program. Where Occupational Home Economics programs are approved, students are eligible for membership in HERO chapters.

Future Farmers of America (FFA), Missouri Young Farmers Association (MYFA), and Missouri Young Farm Wives Association (MYFWA)

FFA is a high school student organization for individuals enrolled in vocational Agriculture programs. The young farmer and farm wives organizations are available to those who are enrolled in the continuing programs in agriculture.

Vocational Industrial Clubs of America (VICA)

VICA chapters are organized for students enrolled in vocational industrial, technical, and health occupations. The organization has a secondary and postsecondary division at the local, state, and national levels.

APPENDIX X

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

FROM STATE PLAN FOR FY 84 -- APPENDIX A

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

Introduction

The FY 84 Labor Demand and Supply Summary provided in this section represents an extraction of figures from the Missouri OIS. In the MOICC Occupational Data Book, OIS data on labor demand and supply are presented by occupational clusters rather than OE Codes or CIP Codes. In order to facilitate the readability of the Summary, the section includes an index which indicates the OE Codes that are associated with each occupational cluster number and name.

The Summary data alone should not be considered as a data base for planning. They are presented here only to summarize the statewide demand-supply relationships for the listed occupational clusters. Effective planning requires consideration of additional national, state and local information. To illustrate the summary nature of the data presented, a sample occupational cluster from the aforementioned Occupational Data Book is included, following the OE Code-occupational cluster index. While the presented sample cluster represents statewide data, it should be noted that Missouri OIS data is also developed for each SMSA.

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

Occupational Cluster	Projected Openings			Estimated Training Program Completions				Difference
	Curr. Emplt.	Proj. Emplt.	Ave. Ann. Openings	Vocational	Proprietary	CETA/Job Corps	Total Supply	Demand - Supply
Agriculture Production (0001)	65,724	43,896	2,440	1,715	19	0	1,734	706
Agriculture Business (0002)	19,384	21,147	1,009	375	0	0	375	634
Agriculture Mechanics (0003)	7,085	5,719	309	2,290	0	15-C	2,305	-1996*
Horticulture & Landscaping (0004)	12,065	11,072	642	217	39	0	256	386
Forestry Logging & Lumber (0005)	4,362	4,667	162	58	0	0	58	
Medical Records Technician (0101)	571	678	29	54	0	0	54	
Dental Assistant (0102)	2,665	3,817	250	137	280	2-J	419	-169*
Dental Hygienist (0103)	327	665	57	92	0	0	92	
Dental Lab Technician (0104)	1,341	1,357	44	22	0	0	22	
Medical Lab Technician (0105)	4,739	5,885	278	145	98	0	243	
Licensed Practical Nurse (0106)	9,276	12,452	845	994	0	44-C 2-J	1,040	
Medical-Nursing Assist. (0107)	21,331	24,595	1,217	647	873	113-C 76-J	1,709	
Human Health Services (0108)	13,000	15,273	782	1,002	9	0	1,011	
Treatment Service (0109)	6,183	7,268	337	274	15	0	289	
Radiologic Technician (0110)	2,075	2,664	124	50	117	0	167	
Registered Nurse (0112)	19,619	22,982	1,252	1,415	566	0	1,981	
Electric Occupations (0202)	24,934	28,340	964	214	149	55-C	418	546
Electronic Occupations (0203)	18,485	23,218	868	1,006	296	63-C	1,365	-497*
Civil Technology (0204)	1,511	1,776	57	36	1	0	37	
Chemical Technology (0205)	2,153	2,242	46	23	0	0	23	
Sanitation & Public Health (0206)	6,059	5,921	213	6	175	0	181	
Industrial Technology (0207)	356	428	15	44	232	0	276	-261*

* = OVERSUPPLY

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FY 84 LABOR DEMAND AND SUPPLY SUMMARY

	Projected Openings			Estimated Training Program Completions				Difference
Occupational Cluster	Curr. Emplt.	Proj. Emplt.	Ave. Ann. Openings	Vocational	Proprietary	CETA/Job Corps	Total Supply	Demand-Supply
Mechanical Technology (0208)	312	338	9	55	5	27-C	87	-78*
Jewelry & Watchmaking (0209)	953	985	53	0	35	0	35	
Air Conditioning & Refrigeration (0210)	7,515	9,131	399	454	412	13-C	879	180*
Textile Tech. & Leatherworking (0211)	37,774	39,367	1,974	273	124	16-C	413	1561
Food Production, Management & Services (0212)	116,987	134,691	6,731	2,028	464	64-C 88-J	2,644	4087
Commercial Aviation (0213)	7,020	9,304	405	127	409	0	536	
Brick & Stonemasons (0302)	3,948	4,095	108	104	0	11-J	115	
Carpentry & Other Construction Trades (0304)	58,285	66,307	2,829	1,928	125	189-C 96-J	2,338	
Plumbers & Pipefitters (0305)	8,338	10,285	509	29	10	0	39	470
Heavy Equipment Mechanics & Operators (0306)	40,606	45,466	1,578	237	431	53-C 19-J	740	838
Automotive Mechanics (0308)	29,286	30,975	832	1,994	252	76-C 36-J	2,358	-1526*
Mechanics, Except Automotive (0309)	4,322	4,518	192	310	62	22-C	384	-192*
Automobile Body Repair (0310)	5,486	5,847	136	729	91	117-C	937	-801*
Drafting (0312)	10,060	11,775	331	482	163	63-C	708	-377*
Printing & Graphic Arts (0314)	23,578	25,074	879	672	115	18-C	805	
Woodworking (0315)	6,492	7,524	309	110	0	0	110	199
Machinists-Tool and Die Makers (0316)	29,891	31,884	1,020	478	81	229-C	788	232
Sheet Metal Occupations (0318)	9,580	11,216	396	99	0	40-C	139	230
Welding Occupations (0319)	15,255	17,336	570	787	405	297-C 73-J	1,562	-992

BEST COPY AVAILABLE

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

Occupational Cluster	Projected Openings			Estimated Training Program Completions				Difference
	Curr. Emplt.	Proj. Emplt.	Ave. Ann. Openings	Vocational	Proprietary	CETA/Job Corps	Total Supply	Demand - Supply
Other Metal Working Occupations (0320)	9,692	11,326	422	76	0	0	76	346
Emergency Medical Tech (0441)	1,624	1,922	99	17	11	0	28	
Police Science (0442)	24,378	28,234	1,725	286	43	0	329	1396
Fire & Fire Safety (0443)	5,079	5,194	99	58	0	0	58	
Advertising (0551)	2,786	3,999	246	208	0	0	208	
Recreation & Tourism (0552)	3,683	4,348	228	169	24	0	193	
Real Estate Marketing (0553)	11,555	13,930	1,263	34	7,682	0	7,716	-6453*
Insurance Marketing (0554)	16,546	17,869	709	34	0	0	34	675
Marketing (0555)	176,149	201,228	9,731	5,090	872	0	5,962	3769
Vehicle Operator (0611)	61,655	65,638	2,159	27	1,028	21-C	1,076	1083
Custodial Services (0612)	50,449	56,773	4,004	53	85	3-C 24-J	165	3839
Barbering (0613)	2,780	2,843	187	0	72	0	72	
Cosmetology (0614)	12,897	12,384	409	137	1,772	0	1,909	-1500*
Child Care Services (0615)	21,824	26,266	1,725	354	0	0	354	1371
Mortuary Services (0616)	1,394	1,341	73	20	0	0	20	
Hotel-Institution Services (0617)	12,177	16,685	1,307	173	0	0	173	1134
Keypunch Operators (0731)	9,019	6,093	- 108	355	342	43-C 3-J	743	-851*
Computer Operator (0732)	6,858	7,237	158	250	0	0	250	
Computer Science (0733)	12,552	14,229	340	1,122	769	0	1,891	-1551*
Bookkeeping & Accounting (0921)	69,515	75,673	3,555	1,961	748	2-J	2,711	844
General Office Clerical/Typing (0922)	102,236	132,117	7,887	5,866	398	417-C 107-J	6,788	1099
Communications Occupations (0923)	35,084	35,490	1,232	24	38	21-J	83	1149

FY 84 LABOR DEMAND AND SUPPLY SUMMARY

Occupational Cluster	Projected Openings			Estimated Training Program Completions				Difference
	Curr. Emplt.	Proj. Emplt.	Ave. Ann. Openings	Vocational	Proprietary	CETA/Job Corps	Total Supply	Demand-Supply
Secretary-Steno (0925)	77,689	98,276	5,568	1,839	473	204-C	3,208	2360
Office Administration & Management (0926)	18,329	21,982	1,167	253	165	0	418	749
Inventory Support Occupations (0927)	22,976	26,285	1,034	0	0	5-C 13-J	18	1016

APPENDIX XI

GROWTH OF VOCATIONAL EDUCATION

GROWTH OF VOCATIONAL EDUCATION
1969-1983

YEAR	NUMBER OF STUDENTS	NUMBER OF TEACHERS
1969-70	144,338	3,885
1970-71	150,256	4,077
1971-72	170,127	4,598
1972-73	173,000	4,742
1973-74	197,643	5,054
1974-75	192,380	5,178
1975-76	225,647	5,488
1976-77	228,276	5,679
1977-78	232,187	6,641
1978-79	242,543	7,010
1979-80	255,835	7,133
1980-81	273,652	6,974
1981-82	274,365	6,998
1982-83*	275,000	7,088
1983-84*	280,000	7,100
1984-85**	280,000	7,105

*Estimated. Includes new area school and adult programs.

**Estimated. Does not include new or expanding programs.

AUTHOR NOTES

AUTHOR NOTES

1. To properly respond to the concerns of Senator Harriet Woods (see her memo dated November 11, 1983), we recognize that the needs of students are also relevant in this investigation. However, on the assumption that socialization benefits are similar across types of education, and that people self-select into areas that suit them best psychologically and academically, we are then left with the major concern being the net economic benefits (both monetary and nonmonetary) that people gain from their education. Thus, we focus on the economic outcomes of vocational-technical education in this analysis.

2. A Cost-effectiveness analysis compares, for any given occupation or aggregation of occupations, the total benefits that accrue to that occupation with the total costs incurred in providing the training for that occupation. Benefits and costs can be both economic and noneconomic. As economic costs, they can be both monetary and nonmonetary. Care must be taken to count only those costs and benefits specific to each given type of educational or occupational training. One must also avoid double-counting -- e.g., don't count both earnings and employment, since earnings is the product of the hourly wage rate and total hours worked, a measure of employment.

3. This discussion refers to all types of students to the extent that the purpose of vocational-technical training is to raise the wage rate or employment of such students.

4. This is not strictly correct. Benefits should include all benefits, economic and non-economic. Likewise for costs. The above formulation represents the "most correct" formulation the availability of data will permit.

5. Note again that the placement ratio says nothing about the duration of employment, total hours worked, or the hourly wage rate earned. These variables are absolutely necessary in order to make any judgment on whether vocational-technical funds are being spent effectively.

6. It is reasonable to assume that youths use vocational-technical education at the secondary level much as they use comprehensive secondary education -- to search and sample from the available set of occupational options for that which is most suitable to them. As labor market studies show, this search process is very intense in early years, declining as individuals move from their teens into their twenties. Thus, one would expect naturally that

that employment-related placements would be low at the secondary level and increase as one progressed through the post-secondary to the adult education level -- just as the data show.

7. The evidence from the Wilms' study is not conclusive, since it is based on a sample of only six occupations in four cities. However, the Grasso and Shea study and that by Meyer and Wise are both based on nationally representative samples of youth. State of the art statistical and econometric techniques are used by both sets of authors. The methods used by Meyer and Wise are superior to those of the other two studies. Among the possible problems in the Shea and Grasso and Meyer and Wise studies is that vocational-technical education is a highly aggregated category, containing a wide variety of skills taught at different levels of quality.

8. This is in part a misspecification of the data since a large majority of those trained in home economics skills are never intended to use these skills in the labor market. Rather, these skills are to be employed in home productive activity. Also, the level of state and federal funding is low in this skill area.

FOOTNOTES

FOOTNOTES

1. U.S. Department of Labor, Bureau of Labor Statistics.

2. See Doeringer and Piore, 1971; Osterman, 1984; Sum and Mazzeo, 1978; Mazzeo and Sum, 1978.

3. See Taylor, Rosen and Pratzner, 1983; Flynn, 1981; 1984; Bottoms and Copa, 1983.

4. See Doeringer, Flynn and Tandon, 1981.

5. See Stevens, 1978; Goldstein, 1983; Freeman, 1983.

6. Missouri Department of Labor and Industrial Relations, Division of Employment Security, Missouri Employment Outlook, Projections to 1985, February 1980, as revised May 1981.

7. A full-fledged evaluation of the Missouri employment projections is beyond the scope of this paper. Such a task is complicated by the fact that the data used in the base year, 1976, for the projections differed by 14% from the actual employment that year as reported by the Division of Employment Security. This is due to several adjustments made in the projections data such as: excluding secondary jobs of multiple job holders; adding estimates of workers with a job but on paid leave; adding estimates for employment in agriculture, forestry and fisheries, non-profit organizations, direct selling and private households. (See Missouri Employment Outlook, Projections to 1985, pp. 34+ for a discussion of the methodology.)

8. Vinson and Harrison, 1979; Munzer and Doody, 1981; Premus, 1982; Doeringer and Flynn, 1982; Riche, Hecker and Burgan, 1983; Business Week, March 28, 1983, p. 85.

9. See, for example, Abernathy, Clark and Kantrow, 1983; Bluestone and Harrison, 1982; Hekman, 1980a, 1980b; Mensch, 1979.

10. Kuznets, 1930; Burns, 1934; Alderfer and Michl, 1957.

11. Levitt, 1965; Vernon, 1966, 1970; Hirsch, 1967, 1972; Wasson, 1978; Norton and Rees, 1979; Utterback and Abernathy, 1975; Hayes and Wheelwright, 1979a, 1979b; Ford and Ryan, 1981.

12. Parrot, 1981; Norton and Rees, 1979; Tilton, 1971; Wells, 1972; Stobough, 1972; Vernon, 1970; Houthakker and Magee, 1969.

13. Abernathy, 1978; Abernathy and Utterback, 1981; Abernathy, Clark and Kantrow, 1983; Hekman, 1980a, 1980b; Hirsch, 1967; Alderfer and Michl, 1957; Hoover, 1948.

14. Flynn, 1984.

15. For a detailed analysis of specific versus general skills, see Becker, 1964.

16. While the basic stages of production life cycles have been repeatedly documented in various manufacturing industries, variations of the pattern are widespread. Industries differ in their rates of change and in their duration in any one state, depending on demand for the product, the degree of competition, economies of scale and the extent of technological degree of competition, economies of scale and the extent of technological progress. In addition, the discovery of new technologies can rejuvenate an industry, causing it to "de-mature" or recycle through the development pattern.

    A recent study of the automobile industry in the U.S. suggests that this industry, in particular, is ripe for "de-maturing". See Abernathy, Clark and Kantrow, 1983.

17. Flynn, 1980, 1981; Taylor, Rosen and Pratzner, 1983.

18. See Doeringer and Flynn, 1982; Browne, 1983. Also see Table 18.

19. Freeman, 1971; Freeman and Hansen, 1983; Fogel and Mitchell, 1974; Doeringer, Flynn and Tandon, 1981; Flynn, 1984.

20. Flynn, 1980, 1984; Olszewski, 1983.

21. See Harrington, et. al., 1980; Harrington and Sum, 1980; Mazzeo and Sum, 1978a, 1978b.

22. Flynn, 1984.

23. See Abernathy, Clark and Kantrow, 1983 for recent analysis of the automobile industry in the U.S.

24. See Shiller, 1982; Flynn, 1981a.

25. See Bottoms and Copa, 1983, p. 348.

26. See Bottoms, May 27, 1983.

27. See Woodruff, No date.

28. Missouri Corporate Planner, 1983, p. 17.

29. Missouri Corporate Planner, 198[illegible], p. 19.

30. Report of Task Force 1990, 1977, p. 43.

31. See Sherman, 1983, p. 78.

32. See Wilms, no date and 1984; Grosso and Shea, 1979; Meyer and Wise, 1982.

33. Perry, et. al. 1975; Bloom, 1984.

34. Odden, 1984, p. 317.

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